Cornell University
College of Human Ecology

Asociación de productores
y exportadores Agrícolas del valle
de Copiapó AG
APECO
"Agricultura sustentable y segura"

IMPLEMENTATION AND EVALUATION PLAN FOR APECO SCHOOL GARDEN PROGRAM

Katelyn Palumbo, Julie Parsons

CIPA Capstone Project

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EXECUTIVE SUMMARY

Asociación de Productores y Exportadores Agrícolas del Valle de Copiapó (APECO), which translates to Agricultural Producers and Exporters Association of Copiapó Valley, is a trade association of growers and exporters of agricultural products. Their purpose is to represent the interests of farmers in northern Chile. The 32 companies that belong to the association produce table grapes, olives, pomegranates and vegetables. It is important to note that APECO represents 90% of the total fruit production of the Copiapó Valley, and 95% of the table grape sector.

In collaboration with Cornell Institute for Public Affairs (CIPA), APECO has investigated ways to give back to their community. Teams of CIPA Fellows have partnered with APECO and have identified school gardens as a powerful opportunity to use APECO's resources, knowledge, connections, and expert personnel for corporate social responsibility programming. During the spring 2019 semester, two additional CIPA Fellows has continued this work. This Capstone team researched best practices for school garden programs to design and implementation plan and evaluation plan for APECO.

Gardens will be created in nine schools: Colegio Felix Susaeta (Manflas), Escuela Amolanas, Escuela Basica Rural Jaime Prohens, Escuela de Concetracion (Los Loros), Escuela J39 de Hornitos, Escuela Paul Harris, Escuela San Antonio, Escuela San Pedro and Escuela Jose Joaquin Vallejos (Ma. Isabel). APECO's intention is to help integrate relevant, technical and professional knowledge into vocation program curricula, and plan a role in building relationships between the schools and local agricultural experts and facilities. Some of the objectives of the school gardens program include:

- Deeper understanding of the environment and the importance of agriculture with students and the community;
- Opportunities to learn about climate change, water scarcity, and environmental impacts;
- Diversified diets and increased nutrition education; opportunities for physical activity; and
- Technical hands-on experience; and entrepreneurial and business skills from processing and selling food.

As the team met with subject matter experts (SME's), reviewed data collected by previous Capstone groups, and literature written on implementing school garden programs, it became apparent that the best course of action would be to start with one pilot school and then

implement gardens in the remaining schools in two phases. One “school garden ready” location with an extremely motivated staff, or “garden champion”, was selected for the pilot. The schools in phase one were selected because they do not have infrastructure barriers, namely space for a garden and access to water. Lessons learned from the process of implementing in the pilot school can be used to inform the process for phase one and phase two. The schools in the second phase have additional challenges to establishing gardens however these issues can be addressed while the first schools are being implemented.

The team created evaluation tools and protocol to measure the impacts of the program and assess the program implementation inform future scaling-up of the project and demonstrate success to secure future buy-in from stakeholders, and measure the impact on the community. The evaluation measures three priority outcomes: diet and nutrition, physical activity, and environmental awareness and sustainable behaviors. Measurement tools were created to collect data from students, parents, and the community. The evaluation is centered around surveys for the different stakeholder groups. The Capstone team reviewed measurement tools from several previous evaluations and designed sample surveys for each stakeholder group. The surveys ask questions on program satisfaction, diet and nutrition knowledge, environmental attitudes, sustainable behaviors, and observed changes from the school garden programs. The team also recommends additional measurement tools that can be used to observe the intended outcomes and confirm the data collected from the surveys.

The team recommends several next steps for APECO and schools to prepare to launch the garden program. The primary goal is to start making connections between stakeholders. First, there should be a dedicated person to coordinate the project and continue to move these efforts forward. This role could be filled by a Project Coordinator hired by APECO or by an intern from Cornell University. They would communicate with schools, coordinate support, and organized events and trainings. In addition, APECO should visit each school to determine their individual needs to prepare for a garden. The schools and program implementers should also consider the most impactful curricula for implantation and for integrating the garden program into students’ experiences at school.

INTRODUCTION

Asociación de Productores y Exportadores Agrícolas del Valle de Copiapó (APECO), which translates to Agricultural Producers and Exporters Association of Copiapó Valley, is a trade association of growers and exporters of agricultural products. Their purpose is to represent the interests of farmers in northern Chile. The 32 companies that belong to the association produce table grapes, olives, pomegranates and vegetables. It is important to note that APECO represents 90% of the total fruit production of the Copiapó Valley, and 95% of the table grape sector.

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The concept of school gardens has been in existence since the late 1800's. Erasmus Schwab published a book entitled *The School Garden: Being a Practical Contribution to the Subject of Education* as a way of encouraging a law mandating school gardens in Austria. In the United States, the first garden was implemented in 1891 in Roxbury, Massachusetts and they flourished from there. At that time, they were used as a way of teaching "hard work, discipline, cooperation, and self-awareness" (Bucklin-Sporer & Pringle, 2010). More modern school gardens in the United States are promoting the same values, but with the added layer of sustainability, nutrition, and increased access to healthier foods. In addition to all of these benefits, APECO is also hoping a proposed school garden program in the Copiapó Valley will be a way of giving children a better understanding of water scarcity, the importance of agriculture in the region and the opportunity to develop entrepreneurial skills that they would not have otherwise.

The team's research focused on previous school garden programs to determine the factors needed for implementing a successful program, the information that would need to be collected from schools to make informed recommendations, and validated methods of evaluation. The team used semi-structured interviews with subject matter experts and a document review of existing literature for a majority of the research.

LITERATURE REVIEW

BEST PRACTICES AND LESSONS LEARNED

In order to develop a comprehensive school garden implementation plan for the selected Copiapó Valley schools, this report includes background research on previously implemented school garden projects, with particular focus on school gardens in small, rural communities, with limited access to water. The focus of this section will be best practices for designing and launching a school garden program and how to measure success.

The benefits of school garden programs to children and the community are known and widely accepted (Blair, 2009; Carlsson, Williams, Hayes-Conroy, Lordly, & Callaghan, 2016; Williams & Dixon, 2013). In 2015, the United States Department of Agriculture (USDA) performed a census and determined that over 42 thousand schools in the United States currently have a school garden program. However, they are less prevalent in other parts of the world, including Chile. If properly implemented and managed, the benefits of school gardens are not impacted by the divide between rural versus urban areas; water secure versus water scarce sites; or wealthy versus poor. The Food and Agriculture Organization of the United Nations (Food and Agriculture Organization of the United Nations (FAO), 2010) reported that both developed and developing countries mentioned the following concerns with regards to implementation and maintenance of school garden programs:

- Sufficient land and water;
- Good garden security;
- Enough time, help, personnel, staff continuity;
- Access to information, expertise, technical support and training;
- Enthusiasm and expertise in school staff and garden managers;
- A platform for sharing experience and ideas; good publicity and promotion;
- A hands-on “food cycle” curriculum, including food preparation and consumption;
- Timetable space and integration into the mainstream curriculum;
- Monitoring and evaluation; transparency in accounting.

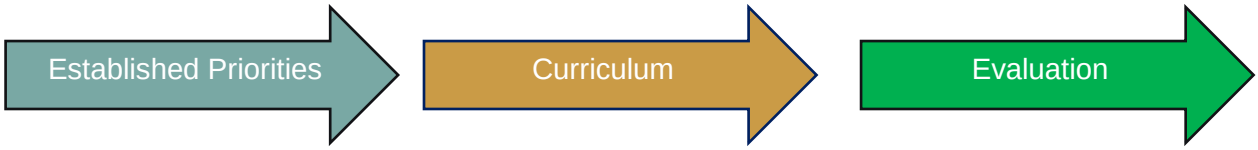
A study by DeMarco, Relf, and McDaniel (1999) surveyed teachers involved in youth gardening for an evaluation and identified factors that teachers consider essential for the success of a school garden. The survey respondents named student ownership and integration of the garden into the curriculum of the other subjects. Some other important factors included a person responsible for school-gardening activities, availability of site maintenance and materials, and

support from the principal. Development and training for teachers is an important part of the design of school projects and has been echoed in several case studies (Hirschi, 2015; Scherr et al., 2017; Viola, 2006).

The implementation plan proposed in this report will answer the following questions posed by the FAO in their article, *Setting up and Running a School Garden* (Food and Agriculture Organization of the United Nations (FAO), 2005):

- What does a school garden involve?
- Who will help us?
- What is our garden for?
- Where do we start?
- What does our garden need?
- What shall we grow to eat?
- What shall we grow to sell?
- How do we grow things?
- How will we eat our garden food?
- What's the plan?
- How do we get going?
- How do we keep going?

Once these questions are answered and there is an implementation plan for the Copiapó Valley schools, an outline of a curriculum would need to be outlined for each of the phase one schools. Much of the literature recommends tying the curriculum to the evaluation tools. The curriculum would be based on the priorities established by the APECO team, which include environmental awareness and stewardship, nutrition knowledge and diversified diet, and physical activity.



EVALUATION TOOLS

In addition to reviewing the existing literature for lessons learned on how to implement successful school garden programs, the initial research for this report included a review of the

methodology commonly used to evaluate programs and their impact on participants' knowledge, attitudes, behavior, and outcomes for the greater community. The research literature discussed here can be used to inform the evaluation design and measurement tools for future use by APECO and to determine the effectiveness of the school garden programs, the benefits to the children participating, and positive impacts in the community.

The impact of participation in a school garden program on children's learning and behavior is most often measured using quasi-experimental pre-/post-test designs or simple post-tests. The indicators most commonly measured in published quantitative studies are science achievement, nutrition knowledge, and change in food behavior. The learning outcomes that are most often studied are health and nutrition and environmental education (Blair, 2009, p. 20).

The following studies used a variety of methods to measure these outcomes. Aguilar, Waliczek, and Zajick (2008) conducted a study on a youth gardening program in elementary schools in Texas. The primary focus of the research was to assess the program's ability to influence the students' positive environmental attitudes and high environmental locus of control. High environmental locus of control indicates that a person believes they have the ability to make a difference in environmental issues and can influence them to be more environmentally proactive (Aguilar et al., 2008, p. 243). This study used a post-only assessment. A questionnaire was created using previously validated questions or statements from the Children's Environmental Response Survey (CERI), the environmental attitude inventory, and the Revised Perceived Environmental Control Measure. The final questionnaire had 28 statements and used a five-point Likert scale. Demographic information was also collected using a coversheet on the questionnaire (Aguilar et al., 2008, p. 244).

The results of the study did not provide evidence of the influence of the youth-gardening curriculum on students' environmental attitudes or environmental locus of control. However, approximately 80% of students reported having previous experience with gardening and the researchers found that this experience was necessary for developing environmental concern (Aguilar et al., 2008, p. 247). There are some aspects of this research methodology that limit the validity of the results. For example, classrooms were assigned to either the control or the treatment group by teacher's volunteering to be involved in the gardening program. However, the measures used to design the questionnaire may be useful resources in choosing survey questions to evaluate the APECO school gardens program.

In a study focused on the determining factors of youth nutrition knowledge and dietary behavior and the influence of an inner-city garden program in Minneapolis, Minnesota, Beckman and Smith (2008) observed participants who were empowered to try new eating, cooking, and gardening behaviors as a result of the program (p. 22). The focus of the research was the Youth Farm and Market Project (YFMP), a 10-week garden program for children ages 8-15 that provided nutrition education three days per week and experiential learning through gardening and cooking activities.

Researchers collected demographic data including participant age, grade, gender, and ethnicity (Beckman & Smith, 2008, p. 13). The pre- and post-intervention survey had 177 questions and took 20-30 minutes to complete. Most questions were based on a five-point Likert scale. The focus of the survey was understanding of nutrition, garden-related concepts, attitude, self-identity, and self-efficacy or "an individual's opinion of how well they can perform a behavior under various inhibiting conditions" (Beckman & Smith, 2008, p. 14). With both surveys, a 24-hour recall was used. Participants were asked to report what food they ate the previous day and how it was prepared. Researchers provided three-dimensional food models and measuring cups to help participants report on the amounts of each food that was consumed. Any "combination foods" were also broken down by ingredient. For example, a sandwich would be reported as bread, meat, vegetables, and dressing. Reported consumption data was entered in the ESHA Food Processor to measure nutrients and good groups. The results of the 24-hour recall in the post-intervention data collection were measured against the data from pre-intervention. There was a significant difference in the results. However, only boys in the program reported increased intake of fruits and vegetables (Beckman & Smith, 2008, p. 21). The findings in this study were heavily influenced by the gender of the participants, highlighting the importance of collecting demographic data from participants and disaggregating results during analysis.

Two studies included in this literature review used primarily qualitative methods to measure nutrition outcomes. The first is case study of a school garden program for elementary students in Nova Scotia, Canada focused on developing food-related knowledge, skills, and values that encourage participation in sustainable food systems. The researchers used observation, focus group interviews with teachers, individual interviews with parents and school administration, field notes and personal reflections, and a document review for assessment of the health, ecological, and social effects of the school garden. The data was coded for analysis and validated through triangulation between methods, member checking, and peer review (Carlsson et al., 2016, p. 120).

In a similar study, Viola (2006) implemented a school garden project as an extension of her work as a nutrition outreach worker in two rural, remote Indigenous communities in Australia. The evaluation of the project took place over a six-month period while the project was being developed and implemented. Viola used a primarily descriptive methodology, including observations and semi-structured interviews, which was supplemented through some quantitative data collection. Some of the assessment tools included activity sheets, a curriculum matrix, and an event log. Similar to Carlsson et al. this study benefited from multiple forms of data collection to triangulate results and provide additional rigor and reliability to the findings (Viola, 2006, p. 235).

The activity sheets were used to collect data on nutrition knowledge before and after the intervention. Students were instructed to draw what they believed to be a healthy meal on the imaginary plate. Prior to participating in the school garden program, the drawings of healthy food often contained high-fat and refined carbohydrate convenience food. In the assessment after six-months of the program, no convenience foods were draw. Fruits and vegetables were drawn by more of the students and some bush foods were also included (Viola, 2006, p. 237). This activity may be a useful data collection tool for the students in the school garden program in Chile as they are accessible to students with varying levels of literacy and numerous and are appropriate for young students who may not be interested in many written forms of surveys or assessment tools.

An evaluation of the Shaping Healthy Choices Program (SHCP) by Scherr et al. (2017) provides a good case study of a program to encourage physical activity as well as increase nutrition knowledge, improve dietary patterns, increase use of science processing skills, foster positive changes in the school environment, and facilitate the development of an infrastructure to sustain the program (Scherr et al., 2017, p. 369). The evaluation found that students who participated in the intervention had significant improvements compared to the control groups for indicators of nutrition knowledge, identification of vegetables, BMI percentiles and z-scores, BMI classification, and waist-to-height ratios. The results provide evidence to support the program's multi-component approach where nutrition and health messaging were integrated into several settings, including the classroom, lunchroom, home, and school community (Scherr et al., 2017, p. 370). The lessons learned from this case can inform the design of the APECO school gardens program. Interventions aimed to reduce or prevent childhood obesity are most effective when there are multiple-points of intervention (Scherr et al., 2017, p. 369). Therefore, a school garden program should be integrated with a broad range of interventions to be most effective.

A separate publication by Scherr et al. (2014) provides details of the program and evaluation design for SHCP. The randomized and controlled intervention was measured using a pre- and post-test design. The researchers identified schools that were statistically similar in school size, ethnicity, and socio-economic factors such as the proportion of children eligible for free and reduced-price meals. From these schools, two were randomly assigned to the treatment group and two were assigned to control (Scherr et al., 2014, p. e14). Assessments and data collection took place of a one-week period before the start of the intervention and after the program was completed. Data was collected from the fourth-grade students who were participating in the program, parents, teachers, and school nutrition program directors. Demographic data that was collected included parent education levels, socio-economic status and student age, gender, and ethnicity (Scherr et al., 2014, p. e18).

Several measurement tools were used and where possible, they were previously-validated. Some of the tools included a nutrition knowledge questionnaire with 35 questions from the U.S. Department of Agriculture MyPlate tool, a test of basic science processing skills, a vegetable preference assessment, a plate waste analysis using before and after photos taken of plates in the school cafeteria, a block food frequency questionnaire to assess dietary intake patterns, a physical activity assessment, and measurements of student's height, weight, and waist circumference used to calculate BMI (Scherr et al., 2014, p. e18). Parents were given a questionnaire made up of questions from the Parent Survey About Nutrition to assess basic dietary habits at home and questions from the Alabama Parenting Questionnaire and the Parenting Practices Questionnaire to collect data on parenting characteristics and styles (Scherr et al., 2014, p. e19). To assess physical activity, this study used activity monitors that resemble wristwatches. Students were asked to wear the monitors at all times for five days before the intervention and in the post-intervention data collection. They measured the time spent in different activity levels throughout the day, daily energy expenditure (kilocalories), and the number of steps taken per day (Scherr et al., 2014, p. e18).

In the vegetable preference assessment, individual taste tests were administered to avoid the influence of peer pressure. Students were asked to identify six vegetables and asked if they would like to taste it. If they tasted it, they were asked to rate the taste and if they would eat it again (Scherr et al., 2014, p. e18). The researchers found that there were some observations pertinent to vegetable preferences that were not captured using this tool. For example, some students declined to taste vegetables because they said that they already were familiar with the way that vegetable tasted. The tool would have been more useful if it included a qualitative

component including observations of behaviors and reasons for declining to taste (Scherr et al., 2017, p. 375). The researchers also found it difficult to assess dietary intake using self-reported data from children in this age group. They state that an Automated Self-Administered 24-Hour Recall System would have provided improved accuracy to the food frequency questionnaire (Scherr et al., 2017, p. 376).

This study will be particularly useful in informing the recommendations for APECO's evaluation design. The SHCP intervention and evaluation design was able to generate significant results after only one year of programming (Scherr et al., 2017, p. 377). Because the goals for APECO are to have a multi-year process of implementation and scaling-up, the ability to observe progress in early assessments results will be encouraging to stakeholders and will support efforts to replicate the intervention elsewhere in Chile.

METHODOLOGY AND DATA COLLECTION

After performing the initial literature review to inform the scope of the project and the best method for creating the deliverables mentioned above, the team identified three subject matter experts with experience in school garden programs and evaluations. Dr. Nancy Wells, professor at the Cornell University College of Human Ecology; Marcia Eames-Sheavly, Senior Lecturer at Cornell College of Agriculture and Life Sciences; and Dalma Cartagena, educator in Orocovis, Puerto Rico and founded the "Agriculture in Harmony with the Environment" program provided invaluable information. To collect additional information about the schools and about APECO, the team designed a questionnaire to distribute, building off the primary research done by the spring 2018 Capstone team. Throughout this process, the team undertook a document review and additional desk-research to understand the best practices of previous programs and evaluations to inform the recommendations to the APECO.

SUBJECT MATTER EXPERT INTERVIEWS

The team identified three subject matter experts (SMEs) to provide input and guidance for the project. These SMEs have extensive experience with school gardening programs, evaluation measures, or both. The team arranged 30-minute interviews with each SME to discuss their insights on the APECO project and to gather information from their experiences that could inform the program and evaluation design. Detailed notes from each interview can be found in Appendix 1-3.

Dr. Nancy Wells is an environmental psychologist and a professor at the Cornell University College of Human Ecology ("Nancy M. Wells," n.d.). Dr. Wells' work is focused on the environment and how it impacts health and behavior (N. Wells, personal communication, March 19, 2019). She has experience evaluating school garden projects and has been involved in previous conversations about the APECO school garden proposal. In the interview with Dr. Wells, the team discussed her work as it relates to this project, especially the evaluation tools that were used in her school gardens evaluation research, challenges with this type of evaluation, and guidance for designing the implementation and evaluation plans.

Some of Dr. Wells' recommendations included using existing measurement tools that have been validated and have been proven successful in previous evaluations with school children in the same age groups as the target population for the APECO evaluation. This approach will be

especially important because evaluations where children are providing data can be very challenging (N. Wells, personal communication, March 19, 2019).

Another approach to combat this is to use multiple sources of information to triangulate the measurement data for each outcome. These sources can include information gathered from teachers or parents as well as students or by using variables that are related to an outcome, such as implications from the outcome being achieved. For example, a change in students' taste for vegetables could be an implication of changes in their diets so taste tests could be a good measure of an outcome related to increasing consumption of fruits and vegetables. This measure may be more reliable than, or add reliability to, surveys asking students to recall how often they eat fruits and vegetables. She also suggested that, where possible, the team use outcome variables that are already being collected such as standardized testing scores or occupational choice data (N. Wells, personal communication, March 19, 2019).

Marcia Eames-Sheavly is a Senior Lecturer at Cornell College of Agriculture and Life Sciences and is also the Children and Youth Program Leader for Cornell Garden-Based Learning ("Marcia Eames-Sheavly," n.d.). She has been a garden educator for approximately 35 years and therefore has expert knowledge of implementing a school garden program, the possible challenges to be mindful of, and the curriculum needed to be successful. From her perspective, there is nothing worse than giving a school all the tools they need to create a garden but then never continuing the support or communication (M. Eames-Sheavly, personal communication, March 21, 2019). This information will be an important part of the recommendations to APECO. Once starting the school garden program, they must continue to provide ongoing support, both for maintenance of the gardens and to maintain enthusiasm among the teachers and families participating in the program. School personnel may have some hesitation or resistance to the project, especially in places that have previous experience with unsuccessful or failed gardens. Demonstrating that APECO is making a commitment to remain a partner in this project and will continue to support the schools with the time-intensive work of maintaining the garden will also help to generate buy-in and address that resistance.

In Eames-Sheavly's point of view, it would be best to pilot the program with one school, offering all of the tools, education and support APECO is planning for the larger program. Then, the success at the pilot school can be a useful tool for preparing and getting commitment from the remaining schools. She suggested holding workshops to prep the next phase of schools at the pilot school so that the teachers can connect and share what they've learned. Eames-Sheavly mentions the idea of being "less efficient" when planning a school garden. Although counter-

intuitive, she believes that the more people that are involved, the more beloved the garden will become, which will lead to the garden being more successful, and might prevent vandalism and people stealing the fruits and vegetables. Participation in the program needs to be voluntary, and it needs to be fun, instead of “one more responsibility” for the teachers and administrators. Eames-Sheavly mentions having a “garden champion”- an individual at each school that is excited about the prospect of having a school garden and is willing to get students, parents and community members involved in the implementation and ongoing support.

The third SME that was interviewed for this project is Dalma Cartagena, an educator in Orocovis, Puerto Rico. She took over a school farm and founded the “Agriculture in Harmony with the Environment” program in 2000. She continues to run the agro-ecology program and to teach her students about healthy food production, environmental protection, and agricultural practices (“Orocovis Learning Community,” n.d.). Cartagena’s farm is an important part of the community in Orocovis. Most of the farm was undamaged by Hurricanes Maria and Irma, especially the root vegetables and plants that grow close to the ground. Immediately after the storms, students were able to bring fresh produce home to their families while most of the island continued to experience food shortages (Klein, 2018, pp. 37–38).

Cartagena stressed the importance of the children being a part of the entire process – from deciding the vegetables and fruits to grow, to eventually harvesting their crops, to learning the best way to prepare the foods. In comparison to Eames-Sheavly’s comments about the importance of getting buy-in from community members at the beginning, Cartagena has a different perspective. Her primary approach to getting the necessary buy-in from her school and education officials is to demonstrate the importance of the garden and show them first-hand the impact it has on her students. She invites school administrators to harvest events so that they can see the happiness in the faces of the students and this has been helpful in generating support from people who otherwise did not see the value in the garden (D. Cartagena, personal communication, April 17, 2019). It should be noted that in their respective roles, Eames-Sheavly and Cartagena are both “garden champions”, even though their approach varies.

COLLECTING DATA ABOUT SCHOOLS

Data about the schools selected for inclusion in this project was needed to inform the design of both the implementation and evaluation plans. The spring 2018 Capstone project team collected some information about these schools during their research and field visit. This information is

displayed below in Table 1 and was the starting point for the team's work this semester. Full details can also be found in Appendix 4.

Information in Table 1 comes from three sources. Columns E-I contain information from the 2018 team's initial research. During their visit to Chile, the 2018 team collected the information listed in columns J-N. Their data collection included focus groups with teachers and school administrators as well as surveys with students (Ramirez Flores & Mosquerira Caminada, 2018). The 2019 Capstone team added the additional information about the schools based on data available on the Ministry of Education's website (Ministerio de Educación de Chile, n.d.).

Because additional data was required about each school to develop appropriate recommendations for the implementation plan and the evaluation plan, the 2019 Capstone team created questionnaires for APECO and for the nine schools selected for the project. The purpose of the questionnaires was to collect more in-depth information than was provided in Table 1 and fill any gaps or questions the team had. The questions were written based on input from the interviews with SMEs, discussed above, and from information gathered during the literature review. The information that the team identified as important to collect from schools included: more detailed background of the schools' past experience with garden programs, how they are planning to use the proposed gardens, which school staff or administrators at each school will be responsible for the garden, and if the schools have policies regarding consent for the students to participate in research. The full questionnaire for the schools can be found in Appendix 6 and the questionnaire for APECO can be found in Appendix 7.

The documents were translated from English into Spanish by the PADM 5910 teaching assistant, Sarah Cartagena, and shared with the team's point of contact for APECO. The APECO questionnaire was completed and returned. The responses are discussed in the Findings section below. Unfortunately, due to the time constraints on the project, the questionnaire has not yet been shared with the schools. The team strongly recommends that this information is collected in the next steps of developing APECO's school garden program and that the information is used to ensure that the program is designed with the specific needs of the partnering schools in mind.

TABLE 1 BACKGROUND DATA ON SCHOOLS SELECTED FOR APECO'S SCHOOL GARDEN PROGRAM

Name of school	RBD	Municipality (Comuna)	Level (Nivel)	Estimated student age	Number of Students	Number of Teachers	Student-Teacher Ratio	Multi-age School	Cost	Access to Water	Space for garden	Main obstacle	Previous/Current school garden	Other notes
Colegio Félix Susaeta (Manflas)	13124	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	82	5	16	No	Free, Private, Subsidized	Yes	Reduced	Materials and capacitation	They started with a small pilot, 2 years ago	Teachers do not have agricultural experience
Escuela Amolanas	446	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	27	3	9	No	Free	Yes, depends on the ranch	200m2	Robbers	They started with a small greenhouse, 10 years ago	Teachers do not have agricultural experience
Escuela Básica Rural Jaime Prohens	13116	Tierra Amarilla	Primary School	6-13	11	1	11	Yes	Free	Yes	30m2	Materials and capacitation	They started with a small pilot, 2 years ago	
Escuela de Concentración (Los Loros)	441	Tierra Amarilla	Pre-school, Primary School starting at 5th grade	Under 5, 10-13	276	32	9	No	Free	Yes	50m2	Robbers	They started with a small greenhouse, 10 years ago	
Escuela J39 de Hornitos	11027	Tierra Amarilla	Primary School starting at 3rd grade	8-13	10	2	5	Yes	Free	Yes, but water depends of the Tank Truck	56m2	Need more people	No	
Escuela Paul Harris	445	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	38	3	13	No	Free	Yes	30m2	Robbers	They used to, but it is gone now	
Escuela San Antonio	447	Tierra Amarilla	Primary School	6-13	8	2	4	Yes	Free	Yes, but water depends of the Tank Truck	Reduced	Materials and capacitation	Now, using pots mainly	
Escuela San Pedro	423	Copiapó	Pre-school, Primary School	6-13	225	20	11	No	Free	Yes, but only drinkable water	1000m2	Access to water	Yes, but is not in good condition because of lack of water	
Escuela Jose Joaquín Vallejos (Ma. Isabel)	11036	Caldera	Primary School	6-13	11	2	6	Yes	Free	Yes, but only drinkable water	Reduced	Materials and capacitation	No	Teachers do not have agricultural experience
	Source: Ministry of Education http://www.mime.mineduc.cl/mime-				Source: Ministry of Education, Chile; As cited in 2018 Capstone Report					Source: 2018 Capstone Report				

DEVELOPMENT OF A PROGRAM IMPLEMENTATION PLAN

An important piece of the implementation plan is the team's recommendation for the order in which schools will launch their garden programs, and the rationale for this. The program will first be implemented in one pilot school, followed by schools in phase one, and then the remaining schools in phase two. Several cases that the team reviewed as part of their research and the interview with Eames-Sheavly, provided examples of projects that began with a single pilot location and discussed the benefits to the approach (Ambusaidi, Al-Yahyai, Taylor, & Taylor, 2017; Taylor, Symon, Dabbs, Way, & Thompson, 2017; "The Learning Garden Pilot Evaluation and Recommendation Study," 2012).

According to information the team gathered, the main benefit of using a pilot school is the information you gain can be used to improve the program prior to it being implemented widely. This critical information can make the difference between a successful school garden program, and an unsuccessful lesson learned. People's memories for bad experiences is much longer than for positive ones. If a school garden fails, the garden champion, community members and staff will be more resistant to begin again, and because of the sizes of the communities, the school may find it difficult to find people to work on the garden a second time. Having a bad experience is worse than waiting until the program is developed and can be implemented properly.

In order to determine one pilot school for the program and the order of implementation for the other phases, the team created a set of criteria to identify a school's readiness to launch a garden. For a school to be selected as the pilot, it would need to be "garden ready", as defined by the following criteria:

- Have the proper site for a garden, including easy access to water, few concerns about thieves, have enough space for a garden, etc;
- Have a "garden champion" – someone excited about the implementation of the school garden, and willing and able to manage, run and campaign for the program;
- Should have current, or previous experience with school gardens.

After the initial pilot school is identified, the remaining schools will be divided into two groups and will start developing and using their gardens in two phases. This design will allow for resources to be concentrated on a small, manageable number of schools during the critical launch period and will create a "wait-list control" design for the evaluation. The group of schools that will start gardens in the second phase will act as a control group. As described below,

baseline and follow-up data collection will take place at schools in both groups and the results will be compared to isolate the influence of the school gardens at the phase one schools.

All data that the team collected about the schools was used to categorize each school as the pilot school, a phase one school, or a phase two school. After the pilot school was selected, the remaining schools were grouped based on size of the school, the age of the students, and the school's readiness to launch a garden. In the SME interview, Dr. Wells recommended that we pair schools in the treatment and control group based on student age, as well as the size of the schools and location. The schools should be distributed evenly between the groups based on their size, in order to increase the validity of the evaluation (N. Wells, personal communication, March 19, 2019). In other words, the pilot and phase one schools will include a small, medium and large sized school, and phase two will also contain a school from each of the three size categories.

Based on the school data, the schools were coded as either small (fewer than 20 students), medium (between 21-100 students), or large (greater than 100 students). The below table lists each school and its categorization by size and student age.

Name of school	**Size** *Small = 20 students or less* *Medium = 21-100 students* *Large = 101 or more students*
Escuela Básica Rural Jaime Prohens	Small
Escuela J39 de Hornitos	Small
Escuela San Antonio	Small
Escuela Jose Joaquín Vallejos (Ma. Isabel)	Small
Escuela Paul Harris	Medium
Colegio Félix Susaeta (Manflas)	Medium
Escuela Amolanas	Medium
Escuela de Concentración (Los Loros)	Large
Escuela San Pedro	Large

TABLE 2 SCHOOL DATA, CHARACTERIZED BY SIZE

The other factor considered in determining the order of implementation, was how ready a given school was to develop a garden. Several schools will require significant preparation to be ready to plant a garden, including irrigation infrastructure, which could cause a delay in implementing the program. The schools that will need the most support before the garden is ready have been selected for the second phase, allowing for additional time for APECO to work with the school to address these issues.

The criteria to determine if schools are ready to begin programming in phase one was informed by the FAO's "What Does our Garden Need?" checklist (Food and Agriculture Organization of the United Nations (FAO), 2005). Information gathered from the interview with Cartagena aligned with the recommendations from the FAO resources and provided additional influence in determining the criteria. The factors identified by the team for selection criteria are listed below.

1. easy access to water. All of the participating schools have some access to water, but only a select few do not have any limitations to that access. For example, two of the schools stated that the only available water they have is for drinking and three of the schools rely on a water truck or a local ranch for water access.
2. It would be preferred: if they had current or previous experience with a school garden. Many of the school have listed school garden experience, but it is unclear whether several of the selected schools currently have a garden, or if they previously had a garden, but it is now not active. The team has listed that as a question for the selected schools.
3. if they had enough space and the proper soil for a garden. Several of the schools noted that they have "reduced" space for a garden, but there are other options for schools with limited space. One of the schools mentioned that they use pots for vegetable plants, which would work for even the smallest spaces. In addition, even poor soil can use additives to increase nutrient value. Having a small amount space or poor soil should not exclude the school from the program, but it should be taken into consideration.

Based on these criteria, the team created a recommended order to the phases of implementation for the school gardens. This order is discussed in detail in the Recommendations section below. Other recommendations included in the implementation plan will address the needs of the schools and how the APECO team can support them as they prepare to develop and care for a school garden long term. As mentioned above, some of the schools will need assistance with irrigation, garden security, training for teachers/staff on how to

manage a garden, etc. In addition, many of the schools listed “materials” as a main obstacle for not having a school garden. The materials needed are going to depend largely on the make-up of the school: if their space is limited, they will need to use pots instead of raised beds; if the space is void of any shade trees, they might need materials and instructions to build protective coverings; if there is a concern about native animals ruining crops, they might need fencing and instructions on how to construct in order to protect their garden.

To determine the appropriate support to give to each school, additional information will need to be collected. The questionnaire that the team designed could be used to gather this data. A representative from APECO who is knowledgeable about these issues should also visit each school to assess their needs.

Cartagena encouraged the group to consider adding agro-ecology elements into the program at the onset, rather than trying to add elements in later. Agro-ecology is a broader view of the relationship between agriculture, water, air, including conservation as well as food. There are multiple benefits to using a more sustainable model: when a garden uses composted materials, the soil needs less water because the compost improves soil quality and kids will learn that the majority of the items they need for their school garden can be found in their local community-soil, seeds, containers, wood.

Another aspect to consider while in the planning phase was mentioned by Eames-Sheavly, who noted that before even breaking ground, the “garden champion” should engage with members of the community. Other studies have found that having a program champion and having the community perceive benefits for a program can influence that program’s sustainability in the future (Scheirer, 2005). It’s important to create an opportunity to highlight the program with the media and individuals in the local area. Promoting the program will lead to more engagement, and a greater feeling of ownership, which may decrease vandalism, damage, and stealing.

The implementation plan will also include recommendations for curriculum resources to support the teachers to integrate the gardens into other subjects they are teaching. As Dr. Wells indicated in the meeting with her, there are many resources available to outline an appropriate curriculum for various age groups. In her study, the team reviewed 18 curriculum resources before selecting the People’s Garden Educational Toolkit Framework (N. Wells, personal communication, March 19, 2019). Eames-Sheavly also recommended additional resources from the California School Garden Network and the Desert Botanical Garden in Phoenix, Arizona (personal communication, March 21, 2019).

FINDINGS AND DISCUSSION

IMPORTANT ISSUES TO CONSIDER IN IMPLEMENTATION PLANNING

The following findings incorporate the lessons learned from the team's interviews with SME's and additional research as discussed earlier. These findings inform the recommendations for the next steps in the process of implementing the school garden program as well as the proposed plans for longer-term implementation and evaluation.

As was mentioned above, the FAO (2010) reported that there were several concerns schools had when starting a garden program. Based on specific school information gathered by this year's and previous Capstone teams, the following needs were identified as particularly relevant to the school garden program to begin with APECO:

- **Sufficient land and water**- Five of the schools mentioned that they do not have easy access to non-potable water making garden implementation nearly impossible. The space available at three of the schools was limited. At least one of them mentioned using pots for their gardens, versus raised beds or ground beds which would take up more space.
- **Good garden security-** Three of the schools mentioned concerns with robbers. In order for the school and community to stay interested and motivated with their garden, they will need to feel their bounty is secure.
- **Enough time, help, personnel, staff continuity-** One of the schools mentioned needing more people involved in the garden program. Five of the schools have three or fewer teachers. The smaller schools may need to include other community members, or parents of the students, in order to have the assistance and continuity they need.
- **Access to information, expertise, technical support and training-** Three of the schools state that their staff do not have any agricultural experience. This is certainly an area where APECO can assist, which will be discussed further in the recommendations section.
- **Enthusiasm and expertise in school staff and garden managers-** Five of the schools state that they "started a greenhouse/ pilot/ garden X years ago". It's unclear whether they are still in existence or not, but as Eames-Sheavly mentioned in her interview, the most demotivating factor is starting a garden but not having the support needed to keep it going.

The following issues are mentioned in the FAO (2010) resources but were not mentioned by any of the schools. Similar to Maslow's Hierarchy of Needs ("The Five Levels of Maslow's Hierarchy of Needs," 2016), the schools are concentrating on the basic needs of starting the school garden program. Even though the following points need to be considered for a successful implementation, the schools themselves are not in a position to think about the actualization or the possibilities of the school garden at this point, which is where APECO and the partnership with Cornell can help.

- A platform for sharing experience and ideas; good publicity and promotion;
- A hands-on "food cycle" curriculum, including food preparation and consumption;
- Timetable space and integration into the mainstream curriculum;
- Monitoring and evaluation; transparency in accounting.

In addition, the FAO provides a checklist of questions to be answered when starting a new school garden program. The questions are listed below in Table 3, along with a) information on that subject gathered by the spring 2018 and the spring 2019 Capstone teams, or b) recommendations to answer the question.

TABLE 1 QUESTIONS FROM FAO (2010) WITH ANSWERS BASED ON FINDINGS TO DATE

What does a school garden involve?	This will depend on the specific school. Additional information should be collected from each school about what they hope to get out of their school garden program.
Who will help us?	APECO is committed to assisting the schools to start and maintain their gardens. A partnership has also been developed with Cornell University who can provide additional support.
What is our garden for?	In general, the benefits to the students, schools and community have been identified in the primary intended outcomes of the program – environmental awareness, diet and nutrition, and physical activity.
Where do we start?	Each of the schools has been approached by APECO and agreed to be part of the program. Next steps for the program can be found in the Recommendations below. Steps to prepare individual schools for starting garden should be identified by APECO.
What does our garden need?	Next steps for the program can be found in the Recommendations below. Steps to prepare individual schools for starting garden should be

	identified by APECO by reaching out to the schools and making visits to assess their needs.
What shall we grow to eat?	Based on consumption information gathered from the 2018 Capstone team, the school gardens should consider growing the following fruits and vegetables (are consumed more than 4x/ week): bananas (56%), pomegranates (51%), apples (50%), grapes (36%), tomatoes (48%), avocados (43%), lettuce (40%), and corn (28%).
What shall we grow to sell?	Based on the entrepreneur section of the 2018 Capstone project, 51% of the students surveyed believed that they could sell products. It stands to reason that the fruits and vegetables grown would be sold, but a process for selling the items and a marketing strategy would need to be developed. This would be a future project and will be discussed more in the recommendations section.
How do we grow things?	We would rely on APECO's vast knowledge to guide the growing process. This would be part of a future project and will be discussed more in the recommendations section.
How will we eat our garden food?	There are certain regional dishes and dietary customs that should be considered. We would rely on APECO to guide this process. This would be part of a future project and will be discussed more in the recommendations section.
What's the plan?	The recommendations for implementation are below, but a detailed standard operating procedure would need to be developed by a team with agricultural knowledge and understanding of the region. This would be part of a future project and will be discussed more in the recommendations section.
How do we get going?	Eames-Sheavly said during the SME interview, that "the last thing the school should do is alter the ground". She prioritized the preparation work: gathering the community members, generating excitement about the program, creating processes and protocols.
How do we keep going?	As we mentioned above, providing ongoing support, training and community opportunities is vital to the program's success. There is more information about this in the recommendations section.

ROLES AND RESPONSIBILITIES

Both the literature and the subject matter experts discussed the importance of well-defined roles and responsibilities, including the value of ongoing support and training. Ongoing support from APECO will be a vital component of success for each school involved in the program.

As mentioned previously, APECO initiated this project as an opportunity to start a corporate social responsibility program and to give back to their community. This school garden program is a good fit to their strengths and has significant potential to provide many benefits to the community, schools, and students. The team is proposing concrete steps to move the program forward in this report, but several of the team's recommendations include APECO staff member time, energy and resources. For the school garden program to be successful and sustainable, APECO will need to ensure they are able to dedicate resources – in the form of materials, staff time, and energy – to this project.

The capacities and preferences for APECO's participation in the program were important to creating recommendations that are feasible. The team created a questionnaire for APECO to provide feedback on the ways that the organization would be able to support the schools implementing gardens. The questionnaire is attached in Appendix 7. It provides a list of the areas where APECO could possibly provide support and asks for the respondent to describe if the organization is open to the idea and the ways that APECO could address the schools' needs.

The questionnaire for APECO was shared with the project's primary point of contact, Maria Jose Sanchez Arrieta, an external advisor to APECO, and she provided the responses. The intention is that the membership of APECO would support the school gardens with some of the materials for building and maintaining the garden while professional staff from APECO would visit the schools to assist with designing and planning the garden as well as with the initial planting. She also indicated that they plan to provide training for teachers or school staff on caring for the garden and integrating the garden into their curriculum through a partnership with the Department of Education, the Department of the Environment, and other government agencies.

IMPLEMENTATION SCHEDULE

The selection of the pilot school was the first step in determining the best way to implement the school gardens in all nine of the schools. In order to have the greatest chance for success, the

hope was to select a school that needs the least amount of effort – from the school staff and from APECO – to implement a school garden. As the team mentioned above, having one or more school staff members that are excited about the garden program is an important first step. The team has been assured by the client contact that all of the sites were selected, in part, because of their enthusiasm about the prospect of a school garden. Since all of the schools have established some excitement and buy-in for the project, the team reviewed the schools for the other two pieces of criteria that the pilot school should meet:

- Have the proper site for a garden, including easy access to water, few concerns about thieves, have enough space for a garden, etc;
- Should have current, or previous experience with school gardens.

Based on these criteria, the team selected **Escuela Basica Rural Jaime Prohens** to be the pilot school. This is based on several factors:

- They have access to non-potable water, which does not rely on a water truck;
- They have the space needed to start a garden;
- They have previous experience with school gardens;
- And their main concern is garden materials- not robbers.

After selecting the pilot school, the team reviewed the remaining schools based on the criteria mentioned above to determine which locations would be implemented in phase one. In addition, the size of the schools was also considered. Each phase contains schools ranging in size so a control group could be maintained for the evaluation tools mentioned later in the report. The team selected the schools for phase one using the decision tree in Figure 1.

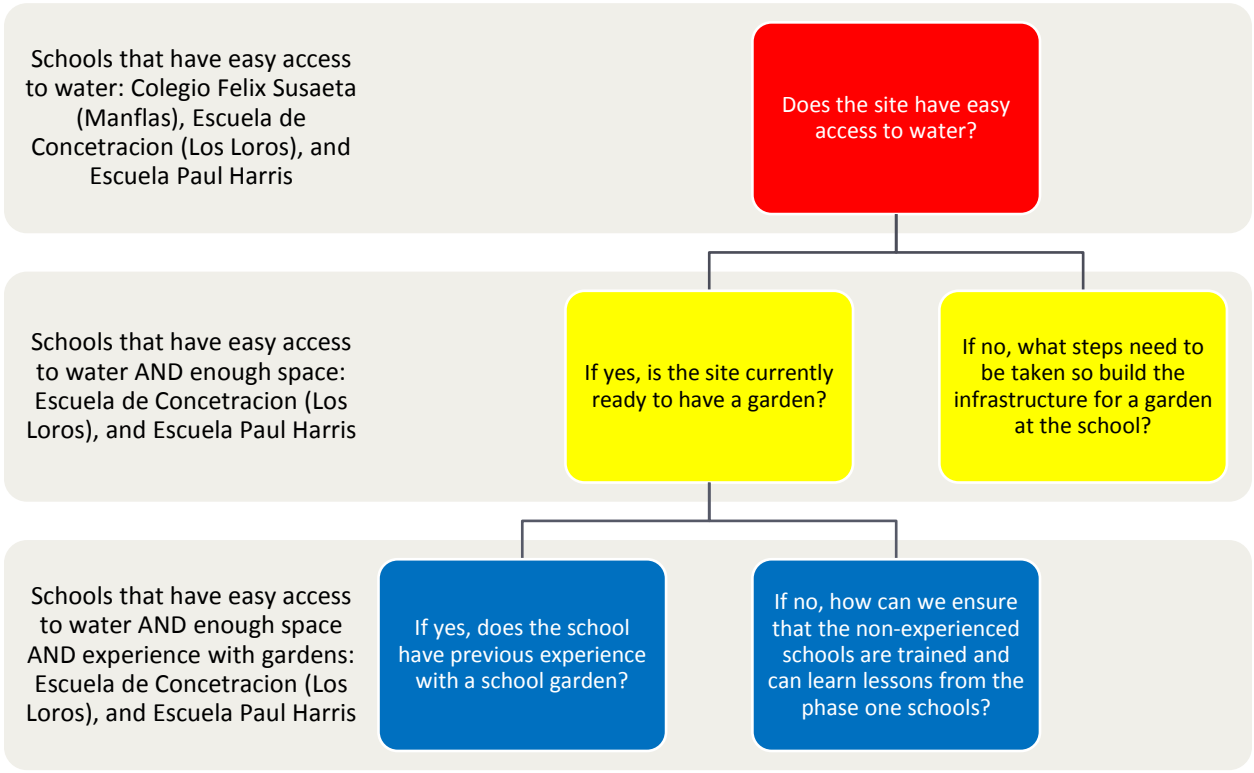


FIGURE 1 DECISION TREE, IMPLEMENTATION PHASES ONE AND TWO

The following schools were identified through this process for phase one implementation: **Colegio Félix Susaeta** (Manflas) (a medium-sized school), **Escuela Paul Harris** (a medium-sized school) and **Escuela de Concetracion** (Los Loros) (a large school). The recommended pilot school, Escuela Basica Rural Jaime Prohens, is part of the small school category, ensuring that between the pilot school and phase one schools, all size schools are represented in both sites with gardens and the control schools.

While implementation starts in the pilot and phase one schools, the team recommends that APECO begin to assist the schools that are not ready to implement a garden. The following schools need additional assistance before they would be ready to implement a school garden:

- **Escuela Amolanos**: their access to water depends on a local ranch
- **Escuela J39 de Hornitos:** their access to water depends on a tank truck
- **Escuela San Antonio:** their access to water depends on a tank truck
- **Escuela San Pedro:** they only have access to drinking water
- **Escuela Jose Joaquin Vallejos:** they only have access to drinking water

EVALUATION PLAN

The other major element of the team's work this semester has been focused on designing an evaluation for the school gardens program. The intention for the evaluation is to both capture lessons learned about implementing the gardens – to inform how the project is scaled-up to other schools – as well as to measure the impact of the program on the children and the community. Findings from the evaluation will also be used to appeal to future supporters. During the interview with the team, Cartagena described how demonstrating the effects that her school farm program has on the students has been the most useful tool in obtaining buy-in and support from outside stakeholders.

The team drafted a logic model for APECO's school gardens program to organize thinking around the impact evaluation. The logic model is attached in Appendix 8 and indicates the inputs and activities that APECO and others are contributing to the school gardens and how they are connected to the possible outcomes. APECO's planned activities and the support that the team recommends in this report are listed in the first two columns of the logic model. It is assumed that the inputs and activities will result in outputs in the form of school garden programs in the selected schools and that student's participation in this program will result in the outcomes listed. The purpose of the evaluation will be to test certain assumptions and relationships between these inputs/activities, outputs, and outcomes.

As previously mentioned in this report, there are three primary outcomes that APECO is interested in measuring – environmental awareness, nutrition and diet, and physical activity. The evaluation methods proposed are primarily designed to test how well the activities and outputs of the school garden program are able to lead to progress in these three areas. As mentioned above, Dr. Wells suggested to organize the measurement tools in a matrix. There are several outcomes to measure and data will be collected from multiple sources for each outcome. Therefore, the matrix allows the evaluators to easily track the data collection based on its intended outcome.

The Evaluation Matrix is attached below in Table 4 and in full detail in Appendix 9. Each column of the table is one outcome to be measured and the rows are divided by the source of the measurement data, also known as the unit of analysis. The matrix has been filled in with the variables the team proposes measuring for each outcome for the appropriate unit of analysis. To determine the best measurement tools for the evaluation, the team completed a document

review including the resources discussed in the literature review and additional evaluation reports from previous school garden programs. As much as possible, the team selected tools that have been validated in previous evaluations and that were used in contexts similar to the Copiapó Valley.

The second purpose of the evaluation plan is to collect lessons learned from the implementation of the program, especially after the pilot phase, to inform improvements made to the process as more schools start their gardens. The recommendations section includes additional measurement tools for evaluators to use to collect data from stakeholders about their experience with the school gardens program. A description of each of the proposed measurement tools as well as the full evaluation plan is in the following Recommendations section.

TABLE 2 EVALUATION MATRIX

	Environmental Awareness and Stewardship	**Nutrition Knowledge and Diversified Diet**	**Physical Activity**
Students	Knowledge of environmental issues (survey; reflective journal)	Rate (number of servings, number of meals per week) student eats fresh fruits and vegetables during lunch (after lunch food tracker) Knowledge of healthy nutrition (healthy plate drawing activity; survey) Preference for fruits and vegetables (taste test)	Number of hours of physical activity (activity monitors) Knowledge of the importance physical activity and ways to be active (reflective journals)
Parents	Knowledge of environmental issues (survey) Number/percent of families that compost, recycle, garden (survey) Observed changes (focus groups, interviews, surveys)	Nutrition knowledge (survey) Rate (number of servings, number of meals per week) family eats fresh fruits and vegetables with breakfast and dinner (food diary) Observed changes (focus groups, interviews, surveys)	Number of hours students participate in physical activity (observation) Observed changes (focus groups, interviews, surveys)
Teachers/School Administrators	Knowledge of environmental issues (survey) Observed changes (focus groups, interviews, surveys)	Observed changes (focus groups, interviews, surveys)	Number of hours students participate in physical activity (observation) Observed changes (focus groups, interviews, surveys)
Community	Rates of recycling, composting, use of alternative power sources (source for data collection still TBD)	Number of people shopping at farmers' market or equivalent (source for data collection still TBD)	Rates of childhood obesity and rates of obesity-related diseases (source for data collection still TBD)

RECOMMENDATIONS AND NEXT STEPS

IMPLEMENTATION PLAN

The team outlined the pilot school, and the schools in the subsequent phase one and two of the school garden program. Figure X shows the cycle for implementing the gardens in the schools. The success of the program will depend on the appropriate resources- monetary and human-being dedicated to the implementation. As we've mentioned above, there is nothing worse than giving a school all the tools they need to create a garden but then never continuing the support or communication

FIGURE 2 SEQUENCE OF SCHOOL GARDEN IMPLEMENTATION

APECO'S RESPONSIBILITY TO THE SCHOOLS

As the team mentioned above, the importance of APECO owning the implementation of the school garden project is key to the program's success. Which leads to what the team believes should be APECO's role in the implementation at all the schools, regardless of whether they are the pilot school or implementing in phase one or phase two. The team believes that APECO is responsible for providing all building materials, properly training the school staff, and providing

ongoing support of the staff and program. This is evidenced by several of the schools mentioning that their teachers do not have agricultural experience.

APECO should help prepare the schools to implement the gardens. Several of the schools are relegated to phase two because they do not have easy access to non-potable water. The team would recommend that APECO provide the materials and labor needed for the schools to collect rainwater before implementing a school garden program there. Another concern reported by a few of the schools were robbers. The team is unsure if this means local community members stealing items from the garden, or wild animals eating the vegetables, but regardless, APECO needs to help protect the gardens so students, staff and the local community members can harvest their crops and reap the benefits of their hard work.

In addition to physically preparing the schools for implementation, APECO needs to work with the school staff to ensure they have an effective curriculum. The team has reviewed several school garden programs, but the literature review and SME interviews lead us to believe that the selected curricula needs to be specific to the school, their structure, student age range, class structure, etc. Both sources agree that the curriculum needs to tie the importance of the school garden program to various aspects of the students' life, including healthier food and physical activity choices; positive environmental impacts through agro-ecology; confirmed impact on the students' family and the larger community.

As mentioned above, having a "garden champion" at each school will help ensure the gardens success. Similarly, having a "program coordinator" will be instrumental to APECO's success. Beyond utilizing existing staff time, APECO should consider hiring a staff member that is able to dedicate themselves to this program. In the months and years to come, there will be initial and ongoing efforts that would be better served by having a "program coordinator" to spearhead all of the individual tasks and guarantee consistency between the schools.

Therefore, we encourage APECO to dedicate a staff member to creating, implementing and maintaining the school garden program based on the specifics of each school. As evidenced by the SME interviews and the literature review, there needs to be an enthusiastic person responsible for gathering teachers, students, and community members to help plan the school garden program in their specific school. With support from APECO, the schools will be able to create a garden that best fits their needs and make decisions on garden design, selection of plants, how the produce will be used (prepared and eaten in school, sold, given to families to take home), how to best market the program and get more community involvement.

EVALUATION PLAN

The timeline for data collection for evaluating the school gardens program is shown below in Figure 3. Ideally, the data collection should be done by external evaluators rather than the teachers, school administrators, or APECO staff to reduce potential biases. These evaluators could be Cornell students, including future CIPA Capstone teams.

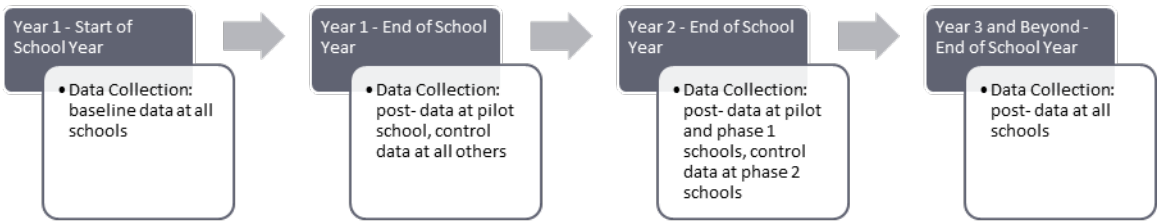


FIGURE 3 EVALUATION PLAN PROCESS MAP

The team recommends starting data collection with a baseline measurement of all indicators at the start of the school year before any school gardens are implemented. This data collection would take place at all schools in the program and should take about one week. All measurements listed in the Evaluation Matrix would be collected during each week-long data collection. This would include surveys with students, parents, and teachers, fruit and vegetable taste tests, information on diet and physical activity habits. A full explanation of these measurements is in the next section.

The baseline information gathered in the first data collection would be used to establish the pre-treatment levels and compared to the indicators measured after the program has been implemented. At the end of that school year, another round of data collection should take place at all schools. The information collected from the pilot school would be post-treatment data. Because the other schools would not have started their school garden programs, they would be considered a control group. This process would continue at the end of the school year each year of program implementation. For example, the baseline data collection could take place in March 2020 and the first follow-up data collection would be in December 2020, at the start and end of the school year when the pilot school begins its school garden program. In December

2021 and December 2022 follow up data collection would take place after the phase one and phase two schools implement their gardens, respectively.

If resources and capacities allow, follow up data collection should take place three or four years after the final phase of schools have implemented their school garden programs. Most of the schools in the sample contain grades one through eight. Therefore, at least some of the students who were in the school in Year 1 would still be attending in the same school. While the analysis is not designed to necessarily track individual students through the years of the program, it will be useful if at least some of respondents had experience with the garden from the start of the implementation. Dr. Wells described this evaluation design, also called "within-group" design and it can give more credibility to the analysis because the same respondents were involved throughout the process (personal communication, March 19, 2019).

The follow-up evaluation several years after the initial start of the program is particularly important. The outcomes that this evaluation focuses on are likely to need some time to make significant changes in the participant's lives. In the first few years of implementation, evaluators might expect to see some changes in participants' daily diet and physical activity habits. However, it may take longer for changes in sustainable behaviors to be observed as they require more changes in perception and may require more work of families trying to make that change. The Evaluation Matrix also includes a few measures of how the garden may have an impact on the greater community around these schools. These outcomes, including community-level measurements of sustainable behaviors and the health effects of diet and physical activity, will not be able to be observed in the first years of the program. Also, it will be useful to see if any changes made immediately after the start of the program have been maintained or if these impacts decrease over time.

Evaluation Tools

The Evaluation Matrix attached in Appendix 9 lists the indicators and methods of evaluation for the program's intended outcomes. The following tools are proposed to collect this data.

SURVEY

Surveys will be used to collect both formative and summative information from students, parents, and teachers for each of the program's intended outcomes. Sample surveys were drafted by the team using survey questions validated in previous studies. Sample surveys for

students, teachers, and parents can be found in Appendices 10-12 and a bank of possible survey questions for students can also be found in Appendix 13.

The student survey was informed by survey questions validated in several previous studies (Heneman, Junge, Schneider, & Zidenberg-Cherr, 2008; Larson, Green, & Castleberry, 2011; Leeming & Dwyer, 1995; Ratcliffe, 2007). Before drafting the sample survey, the team collected all survey questions from these studies that are applicable to this report and organized them in a question bank in Appendix 13. This table specifies the questions' format, the target age group for which the question was validated, the original authors, and which outcome the question measures. Based on the priorities identified in the Evaluation Matrix, a survey was drafted to measure the student's knowledge of environmental issues, knowledge about diet, nutrition, and physical activity, as well as feelings about the school garden program. This survey is attached in Appendix 10.

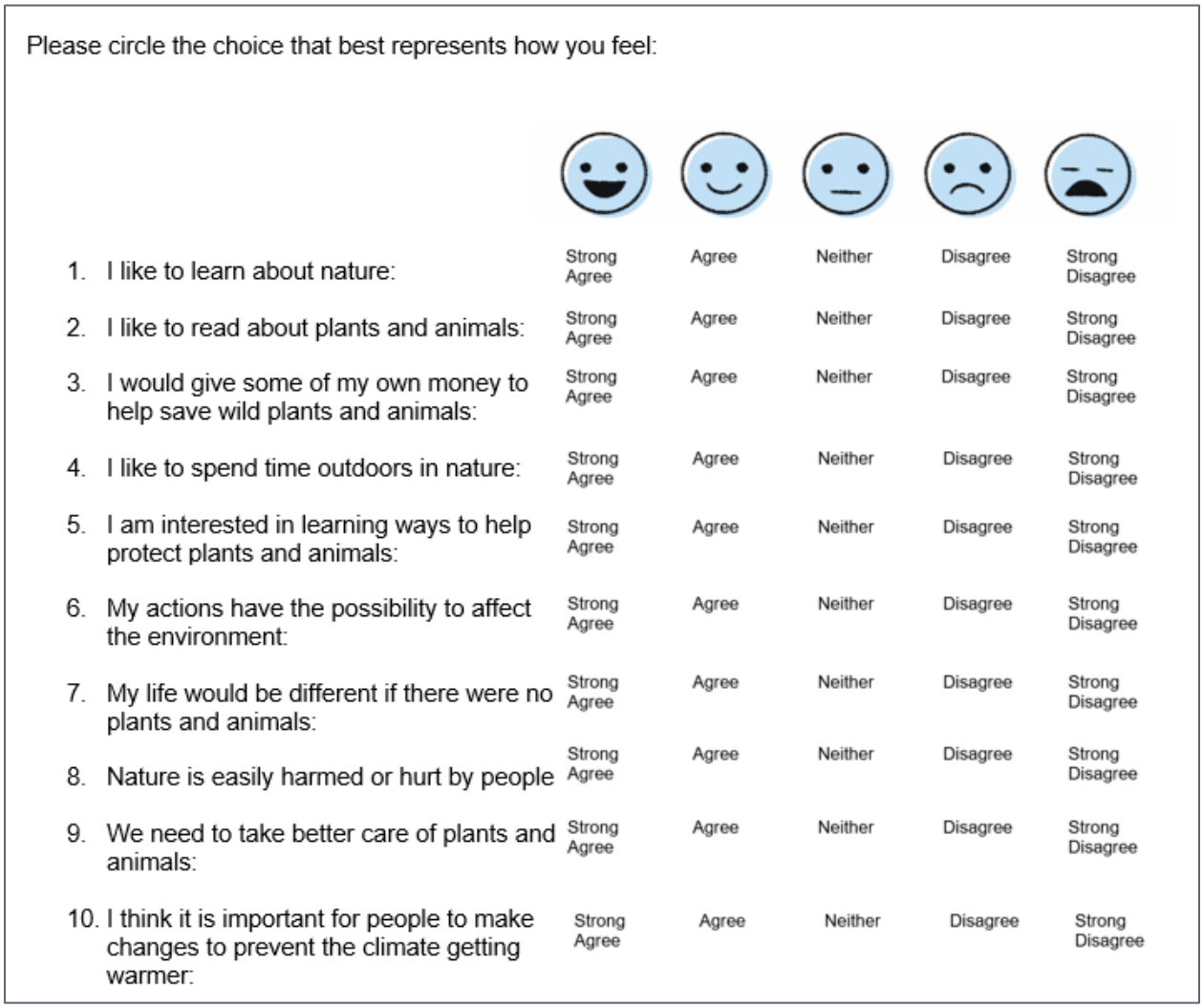
When evaluators are ready to begin data collection, these survey questions should be translated into Spanish and edited to ensure that the concepts and vocabulary used are familiar to the students being surveyed as well as for the parents and teachers. Surveys for children are particularly challenging. In studies validating similar survey instruments, evaluators found that younger children may misunderstand the survey questions, giving inconsistent answers and limiting the findings (Larson et al., 2011; Leeming & Dwyer, 1995). The questions used in these surveys should be written clearly in language that students ranging in age from six to thirteen years old will easily understand. They should also be adapted to make sure the context is appropriate for the community where these programs are taking place.

The evaluators should review the measurement tools, including the surveys, after the evaluation in the pilot year. If they feel changes are necessary, this is an opportunity to revise both the instruments and the evaluation process. However, once the survey has been finalized, it will be important to use the same questions for participants in all schools and in each phase of data collection. Having identical data collected across each observation will improve the analysis and allow evaluators to show any trends in the data over time.

The primary purpose of the student survey will be to measure knowledge of environmental issues and nutrition knowledge and observe any changes after students participate in the school garden program. In the research for the above literature review and the following document review, the team identified several studies that provided examples of surveys that had been used to measure the environmental attitudes of both adult and child respondents (Bunting &

Cousins, 1985; Larson et al., 2011; Leeming & Dwyer, 1995; Milfont & Duckitt, 2010; Ratcliffe, 2007). Environmental attitude is made up of an individual's feelings of the importance of nature, endangered ecosystems, and environmental stewardship (Larson et al., 2011, p. 75).

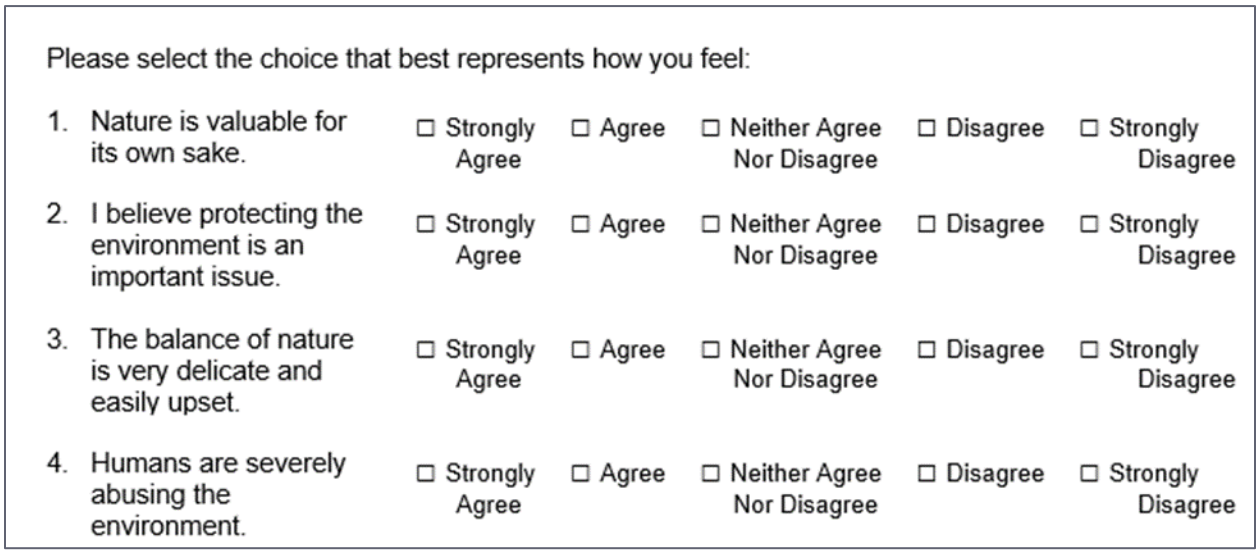
In the initial conversations with the Capstone team, the client described changes in environmental attitude as one of the outcomes that they hope to achieve through the school garden program. The surveys will include questions about climate change, environmental issues affecting the Copiapó region, sustainable behaviors and environmental attitudes to observe changes in the participants. Figure 4 shows a sample of the questions on environmental attitudes from the student survey. These questions were adapted from Larson et al. (2011) and Leeming et al. (1995).


Please circle the choice that best represents how you feel:

1. I like to learn about nature:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
2. I like to read about plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
3. I would give some of my own money to help save wild plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
4. I like to spend time outdoors in nature:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
5. I am interested in learning ways to help protect plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
6. My actions have the possibility to affect the environment:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
7. My life would be different if there were no plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
8. Nature is easily harmed or hurt by people	Strong Agree	Agree	Neither	Disagree	Strong Disagree
9. We need to take better care of plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
10. I think it is important for people to make changes to prevent the climate getting warmer:	Strong Agree	Agree	Neither	Disagree	Strong Disagree

FIGURE 4 ENVIRONMENTAL ATTITUDE QUESTIONS FROM SAMPLE STUDENT SURVEY

A similar survey was drafted for both parents and teachers affected by the school garden program. In order to observe knowledge about environmental issues and the respondent's environmental awareness, the survey uses questions adapted from a study by Milfont and Duckitt (2010). Milfont and Duckitt created and validated an Environmental Attitude Inventory of 120 questions measuring 12 scales of environmental attitude. The questions used for this report are adapted from Scale 6 Environmental Threat, Scale 8 Personal Conservation Behavior, Scale 10 Human Utilization of Nature, and Scale 11 Ecocentric Concern. The questions in the parent and teacher surveys are designed to reflect the data collected in the student survey so that the data collected is easily aligned during the analysis. Questions were also included in all surveys asking about sustainable practices that respondents might be doing at home. The intention for the project is that through garden-based learning, the families involved will increase their participation in activities such as recycling, composting, and conserving water and energy. A sample of the questions in the parent and teacher surveys is found in Figure 5.



Please select the choice that best represents how you feel:

1. Nature is valuable for its own sake.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
2. I believe protecting the environment is an important issue.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
3. The balance of nature is very delicate and easily upset.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
4. Humans are severely abusing the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree

FIGURE 5 ENVIRONMENTAL ATTITUDE QUESTIONS IN SAMPLE PARENT AND TEACHER SURVEYS

The parent survey is also meant to be one source of information on student's diet and physical activity habits. Additional questions were added to ask about the amount of time students are spending doing physical activity and the frequency that they eat fruits and vegetables at home. Most of these questions were adapted from the Parent Nutrition Survey used by Heneman et al (Heneman, Junge, & Zidenberg-Cherr, 2008).

Several program satisfaction questions are included in both the parent and teacher surveys. The teachers will be directly involved with a lot of the garden program and therefore their input will be particularly important. These questions – both Likert-style multiple choice and open-ended – ask teachers to provide information about their impressions of the school garden program and how it was implemented. After implementation at the pilot school and the phase 1 schools, APECO and Cornell partners should review these surveys carefully and consider how they can make changes to meet the needs identified by the teachers with these surveys.

Before implementation, evaluators should work with program implementers to translate and adapt the adult surveys as well. The language used should be common among the target population and the concepts should be familiar. The point of contact for this project has reported that there may be low literacy rates in this region. In addition to adapting the survey questions to suit the target respondents, evaluators should test the questions to ensure they are appropriate and be prepared to conduct the survey verbally. This should include training evaluators to ensure consistency in data collection and following necessary verbal consent protocols for research with human subjects. Evaluators should also be careful to respect the respondents and avoid putting them in a situation where they are embarrassed by their level of literacy (Murray, Kirsch, & Jenkins, 1998).

MEASURES OF DIET AND NUTRITION

Based on advice from Dr. Wells, the team recommends additional measures to observe changes in nutrition knowledge and habits. The intention is that these data collection measures will provide additional insight into the changes in how participants think about food and what they eat over the duration of the program. Students will be given a Healthy Plate activity, a fruit and vegetable taste test, and asked to record what they eat for lunch. During analysis, there is also an opportunity to compare this data with the survey responses to see how participant's behaviors compare with self-reported fruit and vegetable consumption.

The Healthy Plate activity was adapted from an evaluation by Viola (2006). Appendix 14 is an example of a handout that can be used for this activity, available online from Nourish Interactive (Nourish Interactive, 2012). During data collection, each student is given the handout with a blank plate and asked to draw a picture of a healthy dinner. This activity should take place during each stage of data collection identified in Figure 2. Evaluators should observe what foods are drawn on the plates. They can count the frequency of certain food categories such as fresh

vegetables, fruit, lean meats, fast food, and soda. These frequencies will be compared in the pre- and post-treatment data. If the school garden is successful in meeting its intended outcomes, instances of fruits and vegetables should increase and unhealthy foods such as soda and processed snacks should decrease.

According to Dr. Wells, a taste test can be a useful proxy measure for increased consumption of fruit and vegetables for kids (N. Wells, personal communication, March 19, 2019). In theory, if students have been consuming fruits and vegetables more often, they will be more willing to try them in a taste test and will give those foods a higher rating. This method was also used by Scherr et al. (2014) in the evaluation of the school-based Shaping Healthy Choices Program. During data collection, students should be given individual taste tests. The evaluator will ask the student to identify the fruit or vegetable and ask if the student would like to taste it. If they do taste it, the evaluator should ask the student to rate the taste and if they would eat it again. Evaluators should record each of these answers. The student's willingness to try the food, rating of the taste, and willingness to eat again should be compared in the pre- and post-treatment analysis. Scherr et al. also report that evaluators should ask why students choose not to taste the food and record the answers with the other data collected. They observed that students would turn down the vegetable being tested because they had had it before and already knew what it tasted like (Scherr et al., 2017, p. 375). This information should be included in the analysis because it also has implications on the diet trends that the evaluation is tracking.

The last measure of the student's diet habits will be to ask students what they are eating at lunch. During the week of data collection, students will be given a food diary. After students return from lunch each day, their teachers will ask them to write what they ate in their food diary. The students will be asked to be as specific as possible. This method is designed to avoid the errors associated with using 24-hour recall with children by having them record what they've eaten immediately after the meal.

Similar to the Healthy Plate activity, evaluators should compare the frequency of certain key foods before and after participation in the school garden program. There are also programs available for evaluators to use to break down the foods reported from participants into the component nutrients to therefore measure how the nutritional intake has changed throughout the program. Beckman and Smith (2008) used the ESHA Food Processor in their evaluation of the impact of a garden program.

One of the outcomes this evaluation will measure is the impact that the garden program has on the families of participating students. Program designers at APECO would like to test the idea that the garden program at schools can lead to changes within families when students pass the impact of the intervention on to their parents and families by sharing the things they have learned at school. Therefore, there this report also recommends collected data on diet and nutrition from families.

During each week of data collection, parents who complete the survey will also be asked to record the food that they and their families eat. Evaluators can either ask parents to complete hand-written food diaries or can use an online platform for this data collection. Using a food-frequency questionnaire, such as the National Cancer Institute's Automated Self-Administered 24-Hour Recall System (ASA24) can increase the accuracy of the data collected (Scherr et al., 2017, p. 376). Evaluators can register the research on the website and then use the tool for data collection. This platform is also available in Spanish. Assuming that the families have the necessary internet connectivity to use ASA24, this method of collecting nutrition information is the best option for the proposed evaluation.

MEASURES OF PHYSICAL ACTIVITY

The primary variable for measuring the program's influence on physical activity is the number of hours students spend exercising or being physically active per day. The most accurate way to measure this data is by using wearable physical activity monitors. In their study Scherr et al. had students wear physical activity monitors on their wrists for five days of data collection. They measured time spent in different activity intensity levels, daily energy expenditure, and the number of steps students took per day (Scherr et al., 2014).

While physical activity monitors are the best practice for measuring this information, they could be challenging to use because of the cost related with purchasing them. Even if a sample of students were selected for this part of the data collection, the expense of purchasing activity monitors in bulk could be quite high. The team recommends that future evaluators consider rental options for this data collection equipment.

If it is not possible for future teams to use physical activity monitors to collect information on physical activity, they will need to use observation to assess the frequency of physical activity among the students in the program. The parent and teacher surveys both have questions asking the respondent to report how many hours per day they see their children participating in

physical activity. In addition, when evaluators visit schools for data collection, they can take observations about how students spend their day. Evaluators can collect information about how many hours students spend in their seats in classrooms, how much time they spend outside or participating in activities during the school day, and the kinds of activities that they do.

If the program is meeting its objective, the number of hours that students are doing physical activity will increase during the course of the program due to both the opportunity to do activities in the garden during the school day and because of lessons learned on the importance physical activity and a healthy diet during their classes. In order for the program to have this impact and several of the others discussed in this report, these lessons about diet, nutrition, physical activity, and environmental issues will need to be integrated into students' experiences in the classroom and throughout the school day. Further discussion on filling this need is in the recommendations for APECO's involvement in the program.

MEASURES OF IMPACT ON COMMUNITIES

APECO has also expressed interest in this project's ability to create positive change in the community at-large. To measure this, the Evaluation Matrix in Appendix 9 includes proposed methods for each of the intended outcomes. For example, evaluators can collect publicly available data that indicates the rates people are participating in certain sustainability behaviors. Variables such as rates of recycling use, rates of compost use, or frequency of solar or alternative energy can be found in public records or collected from local government or service providers. Changes in these variables could indicate a change in the community's attitude about the environment. Evaluators could collect information from local produce on the volume of fruits and vegetables that they are selling. Increases or decreases the rates people are selling produce could indicate changes in the community's dietary habits and, by extension, the community's understanding of nutrition needs.

For outcomes related to health and obesity, the government of Chile or international organizations, such as the World Health Organization (WHO) or the World Bank, may publish data that can be used to observe changes over the course of the program. Evaluators could collect this available information to investigate the impact that the school gardens program has on the rates of childhood obesity or rates of obesity-related diseases. These variables are related to the longest-term impacts that this program could have. While it would be useful to

collect this information during the period of data collection previously proposed in this report, it will be more important to follow-up on this research in future years.

Evaluation of Program Satisfaction and Lessons Learned

In addition to measuring the impact that that program has on participants and the community, it is important to collect data on the program implementation. By taking the time to monitor and evaluate the program, implementers and learn invaluable lessons on the methods and processes that have been successful as well as what needs to be changed. The implementation plan is designed with one pilot school to start, in part, to give the opportunity to look back and review after that first year and make changes to the implementation going forward.

Each of the surveys that are attached to this report includes some questions asking about program satisfaction. The student survey has a few questions asking about how students are using the garden as well as what parts of the garden program they are enjoying. This information can be used in the analysis of the outcome data and can give a basic indication on the success of the implementation. If the students overwhelmingly dislike the school garden, then significant changes need to be made. The bulk of the program satisfaction data collection will come from parents and teachers. The surveys for each of these stakeholder groups ask questions on the respondent's impression of the program, aspects that they enjoy, and the things they think should change.

In addition to the surveys, the Capstone team recommends holding focus groups with stakeholders involved in the implementation at the pilot location, including the parents and teachers who filled out the survey and APECO growers. Evaluators should create the questions for the focus groups based on the responses they receive from the surveys. Topics can include thoughts about the garden, observed changes in the students, positive and negative experiences that they have had with the program, their thoughts on the process of starting up the program, the things they think have gone well, and the ways in which the program can improve.

Semi-structured interviews can also be used to collect this information when people are not able to join a focus group or when evaluators feel that a focus group participant has additional insights to share. The benefit to semi-structured interviews are that participants have time to

share in-depth information and evaluators can ask follow up questions to tease out useful feedback (Powers & Purington, 2019).

Focus groups and other efforts to collect input from the people implementing and participating in the school gardens are also an important tool for cultivating a sense of ownership that is necessary for the sustainability of the program. Studies have found that involvement of stakeholders in the design of a program is an important influence on the long-term sustainability of that program (Scheirer, 2005; Shediac-Rizkallah & Bone, 1998). This idea was raised in the SME interview with Eames-Sheavly and Cartagena who described the importance of seeking input from the program participants to instill excitement for the project. Also, by allowing for the flexibility to modify processes based on the feedback from participants, programs are able to focus their efforts on the greatest perceived need and make the delivery of programs easier (Scheirer, 2005).

Analysis

As discussed earlier, a benefit to the phased implementation proposed by the Capstone team is that allows for a "waitlist control" experimental design. Therefore, data collected from schools that are implementing the garden program later in the sequence can be used to compare to the post-treatment data collected from the earlier schools. These late-implementing schools act as a control group. As such, it can be assumed that changes observed between baseline and follow-up data collections represent the effect of forces other than the school garden program that could have an effect on the outcomes measured in this evaluation – nutrition and diet, physical activity, and environmental awareness. The control group represents the changes that might have been observed in the early schools if they had not started a garden. When comparing the data from the control group schools and the schools that have gardens, impacts at the garden schools that are not observed at the control group schools can be attributed to the garden program. This analysis is strengthened by making the group of early-implementing schools – schools selected for pilot and phase one – as similar as possible to the control group. Therefore, each group has schools that are small, medium, and large.

It is also important to include demographic factors in the analysis. The surveys as respondents to provide some demographic information including age, gender, occupation (for parents), and the town where they live. Evaluators can also collect public information on the average income, rate of poverty, and racial make-up of each school or municipality. All of these factors could

have an influence on the effectiveness of the program. By observing how the outcome data differs between different groups, improvements can be made to the program to target populations with limited access or to decrease the roadblocks limiting the program's effectiveness.

NEXT STEPS

The team is reluctant to outline a specific timeline for the school garden program, but feels comfortable sharing our recommended next steps.

APECO Staff or Intern Responsibilities

In order for the program to move forward, resources need to be allocated for there to be a program champion. This position differs from a garden champion in that, this position is the liaison between APECO and the school staff. The program champion would be responsible for the following:

- Visit the school to determine if they are ready for the garden to be implemented;
    - If not, what things need to be done before implementation can happen?
    - Working with APECO to identify resources to make that upgrade happen so they are ready to implement a garden in phase two.
- Identify the school garden champion at each of the schools to be their point of contact for all things garden related at their school;
    - The garden champion will work with a team of school staff, parents, community members, etc to determine a school specific implementation plan;
        - Confirm the fruits and vegetables to grow and how much of each;
        - Determine their priorities for what they would like to see happen with the produce they harvest- prepare/ eat it in the school, send it home with the students, sell, process so it can be stored in case there is another disaster; etc.
        - Work with APECO to create a training sheet on how items are planted, tended to, harvested, prepared for consumption, etc
- Determine the best marketing strategy;
    - How can you get community buy-in?

    - Work with the garden champion to create a group of involved parents, students and community members;
    - Create opportunities to highlight the program in the media;
- Identify ways (part of the curriculum, included as part of the garden COP, etc) to encourage agro-ecology driven processes and implement them into the gardens day-to-day operations;
- Create a process for ongoing support, training and engagement for the schools;
    - Utilize the garden champion at the pilot school to assist in the training- sharing first-hand experience will enhance the learning;
- Implement the pre- and post- evaluation tool provided
    - The evaluation tools will include goal evaluations as well as program evaluation tools;
    - Determine the best way to revise the existing program, and implement changes.

School Garden Implementation Plan

Based on information gathered from the subject matter experts and the literature review information regarding the most critical garden needs, and comparing that to the information gathered by the 2018 Capstone team, we recommend implementing in the following format:

School	**Size category**	**Pro's**	**Con's**	**Implementation phase**
Escuela Basica Rural Jaime Prohens	Small	Access to water; previous experience with gardens	Need building materials	Pilot
Colegio Felix Susaeta (Manflas)	Medium	Access to water; had a small pilot 2 years ago	Teachers have no ag experience	Phase 1
Escuela de Concentracion (Los Loros)	Large	Access to water; started with a small greenhouse 10 years ago	Concerns about robbers	Phase 1
Escuela Paul Harris	Medium	Access to water; had a garden in the past	Concerns about robbers	Phase 1

Escuela San Antonio	Small	They're currently using pots for their garden; access to water	Water depends on tank truck	Phase 1
Escuela Amolanas	Medium	Started with a greenhouse 10 years ago; access to water	Robbers; water depends on ranch; teachers no ag experience	Phase 2
Escuela San Pedro	Large	Access to water	Only drinkable water; have garden but in poor condition because of lack of water	Phase 2
Escuela J39 de Hornitos	Small	Access to water	Need more people; water depends on water truck	Phase 2
Escuela Jose Joaquin Vallejos	Small	Access to water	Only drinkable water; no ag experience; no previous garden experience	Phase 2

Implementing in schools better prepared for a school garden will help ensure their success, as well as the success of the program overall. While the pilot school is implementing a garden, APECO staff can be visiting the phase one locations to ensure they are prepared, and can be reaching out to phase two schools to update their sites infrastructure so they are ready to implement in phase two.

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APPENDIX

APPENDIX 1 – NOTES FROM INTERVIEW WITH DR. NANCY WELLS, MARCH 19, 2019

Description of work with school gardens

- Studies the environment and how it affects health and behavior
- Teaches about research design and the best way to identify causality
- School Gardens research with USDA and Robert Wood Johnson foundation
    - Four states: IA, AK, NY, WA
    - Data collection four times over 2 years
        - Physical activity: observation, accelerometry, survey (NY only)
        - Nutrition: photograph lunches and software analysis
        - Science learning
    - Challenges with little kids

Feedback on initial plans for APECO school garden evaluations

- Creating evaluation tool based on outcomes
    - Find existing measures – valid, reliable, used previously with the same age group
    - Multiple sources, triangulation
    - Measure variables that are the implications of the outcomes that we are trying to measure
        - Ex: taste test for change in diet
        - Can compensate for limitations
    - Baseline
        - What is unit of analysis? Always 2nd grade students or the same students when they are in 2nd grade and when they are in 7th grade?
        - Baseline at start of year and first follow-up at end of year (with-in groups design)
    - Feedback loop: hear from teachers, principals on successes and challenges, improving for next year
    - Unit of analysis?
        - Individual kid? Class?
        - Outcome variables that are already collected
            - Standardized testing? Occupational choices?
        - Make a matrix with unit of analysis vs. outcomes
    - Information from schools
        - Control schools for waitlist design, still collect data
        - Logic for matching schools: size, region, age
- Implementation plan
    - Curriculum evaluated in past study with cooperative extensions from each state
    - Practicalities and logistics: water, sun, shade
    - What happens over the summer? Neighbors help maintain and can take some produce? Partner with a soup kitchen? Parents? Teachers?

APPENDIX 2 – NOTES FROM INTERVIEW WITH MS. MARCIA EAMES-SHEAVLY, MARCH 21, 2019

Questions:
Please describe your work with school gardens?
What lessons can you share on starting a new garden?
What to schools need to be ready to start a new garden program?
What information should we collect from the schools to assess their readiness?
Any advice on selecting curriculum resources?

Discussion notes:

- Work as a garden-based learning education for 35 years
    - Currently working on a state-wide school gardens program doing development and creating resources for educators, focus on the multiplier effect
    - Lead students on trip to Belize for the Gate Project
    - Working on piloting a garden curriculum related to climate change
- Curriculum Resources
    - "Curriculum is important"
    - Existing resources:
        - FAO school garden literature
        - Cornell
        - California School Garden Network (will also point to other resources)
        - Phoenix, Arizona - Desert Botanic Garden Program
- Starting a new garden program
    - Start small: have one passionate teacher with a small space and have it be awesome
    - Start with a nucleus, stabilize, and then get bigger
    - Get as many people involved as possible, have ownership
        - Get teachers who are on the fence excited
        - Ex: summer adopt-a-garden program, people just need to be there, not need to do any work
    - Avoid it becoming a burden
    - Need ongoing support and professional development for people involved
        - Support from avid parents, volunteers
        - Professional development trainings and workshops by invitation
        - Continuously inject ongoing excitement
    - Have children involved in the planning; children's interest in gardening is connected to decision making
    - In a process of change, people what tom make structures but first need to work on identity, mission, activities/programming and that will inform the structure
        - Don't shoehorn a program into a structure
        - Ex: Ithaca Children's Garden was an after school program first
    - "Last thing to do is alter the ground"
        - Start with curriculum on plants, grow stations – this will build excitement
        - Make sure people understand the "why"
- Phasing:

- Start with who is most passionate: the teachers that really want to go or already have something like this
- Then host workshop at the first school for teachers about to go in next phase (excitement)
- In small schools, find garden champions in parents
    - Use all skills in the community: gardening, teaching/communication, construction
- If the garden is imposed on a school without excitement, students will get the idea that it is bad
- Robber/vandal challenges:
    - The more people who are involved and the more beloved the garden is, this is less likely to happen
    - “Be less efficient”

APPENDIX 3 – NOTES FROM INTERVIEW WITH MS. DALMA CARTAGENA, APRIL 17, 2019

What was it like to start her school garden program?

- Work for Department of Education, originally part of agriculture vocation education program, existed for approx. 85 years, two teachers before Dalma to teach agriculture
- Dalma started in 2000 had organic view, while the other teachers taught conventional agriculture with fertilizer and pesticides, but she started composting at the school.
- Started to change to agro-ecology rather than just organic. Organic is a short term view, agro-ecology a broader view of relationship between agriculture, water, air, including conservation as well as food, started around 15 years ago.

Who do you need to get buy-in from? Are there challenges?

- It's a fight every day, especially with administration.
- They don't see how important it is to produce healthy food. Administration has an idea of garden with flowers, which needs lots of pesticides, but they don't understand that you need to carry the manure, grass clipping, weeds around the school.
- Struggle with the adults, through the years, but started gaining respect, then the Department of Education saw them as a model.
- At the beginning, Dalma would fight back and try to convince everybody, now she is just showing them the harvests, and seeing the student's happiness in their faces, and they start to see it differently. Instead of fighting/ arguing, she is taking pictures of process, and sharing the notes the students take and diagrams of process of learning.

Funding?

- Part from Department of Education. They created proposals in 2000 and received a grant from Department of Agriculture for tools, refrigerator, and tiller.
- From 2006-2011, they received 3 grants from Ford International for new tools, and they built a little house for the vegetable seedlings, a little greenhouse, a compost area, which was rustic, but it sent the message that you can do agriculture with the things you have. The tools are the things that you need to replace, because they get worn out.
- In 2012 - Slow food international, Dalma and her group presented work in a study, and were invited to go to Italy (Mother Earth event); invited again in 2014, and she took two

students (one about to finish BA in agronomy). Later, she wrote a proposal and they were able to build a kitchen, and establish a banana plantation.

- Then in 2017, the hurricane hit and people started seeing what we have done, the importance to the kids, the school, the country, etc.; and it showed them how to produce food in a crisis

Integration with other school subjects?

- They have a regular school with standard subjects, and some teachers take advantage of farm by coordinating/combining with Spanish class to use area for them to write composition; used by English Teachers; Science teacher research project with beans and relation with different stages of the moon. Other research projects, using compost. Took a lot of energy and struggles to achieve the coordination.

Does she have a curriculum that she uses? What resources do you use to create curriculum?

- Department of Education gives guidelines, and we follow them and work with new curriculum, called pedagogy of the earth rather than vocational agriculture.
- Trying to organize the farm as a national education center of agro-ecology education. Then they would be able to teach students from other parts of Puerto Rico

How do you measure the impact?

- University of Puerto Rico did some research (Gladys Capella), but it felt short. We were observing for a few months, but can be done in a deeper way. They interviewed people from the community, did 3 different focus groups in the community, with current students, and with former students.
- The process was slow. It took 20 years and a hurricane for people to understand, it takes a long time for the community to understand and to get involved.
- After Hurricane Maria, people from around the world and around island want to come and volunteer.
- Project has touched a lot of people in a lot of ways, schools come from different parts of Puerto Rico, teachers, environ groups come to learn what we do.

What did you learn that people who are starting new gardens need to know?

- Most important thing to accomplish is the harvest. They need to make sure that they harvest with the kids- that is the way the kids convince themselves, and it's empowering.

- Other things are secondary- need to try and get people to see the harvest process (from the seed to the harvest process) - "magical energy in the Harvest".
- Don't argue with anybody- just do what you have to do. Don't spend your energy- just plant and harvest.
- The importance of composting: it is the key to any garden project (once you start using compost, you need less water, because improve soil quality)
- All the resources that you need, are around your community - seeds, soil - if you don't have healthy soil, you can add things to make it healthy.
- Water sources: 2 cisterns to collect rain water, municipality tap water
- Kids are more open than adults. Adults have a hard time with new ideas.
- Interesting to show people the process and the things the kids are doing.

APPENDIX 4 – BACKGROUND DATA ON SCHOOLS SELECTED FOR APECO GARDEN PROGRAM

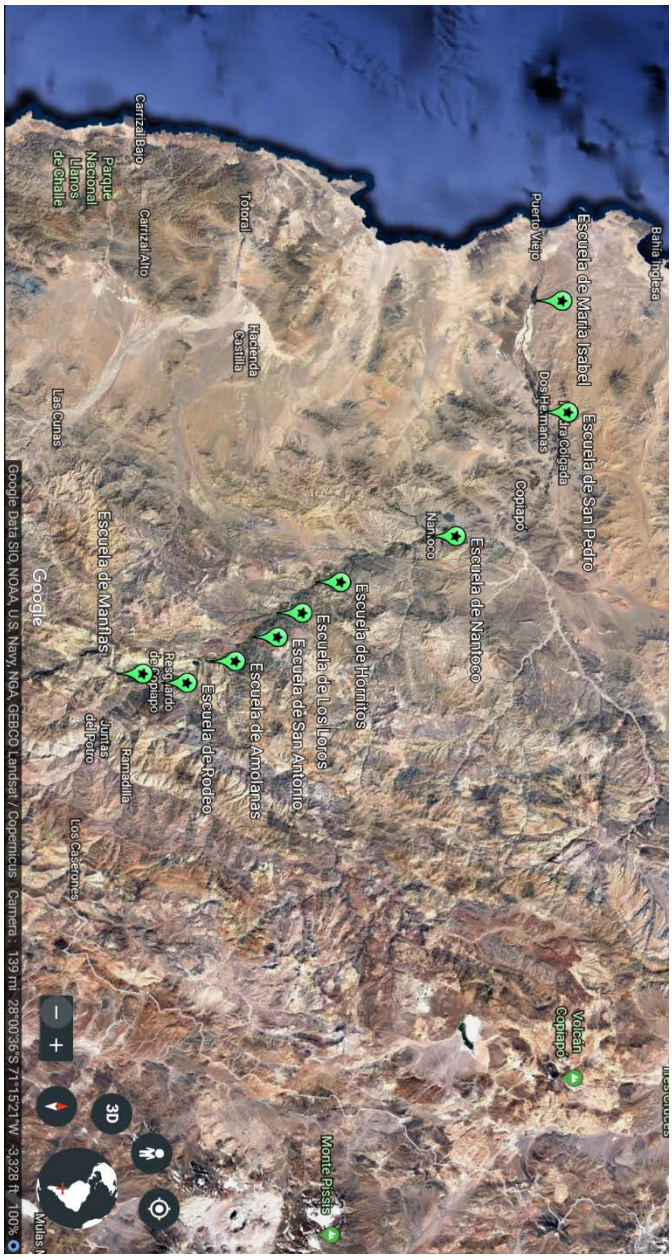
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)
Name of school	**RBD**	**Municipality (Comuna)**	**Level (Nivel)**	**Estimated student age**	**Number of Students**	**Number of Teachers**	**Student-Teacher Ratio**	**Multi-age School**	**Cost**	**Access to Water**	**Space for garden**	**Main obstacle**	**Previous/Current school garden**	**Other notes**
Colegio Félix Susaeta (Manflas)	13124	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	82	5	16	No	Free, Private, Subsidized	Yes	Reduced	Materials and capacitation	They started with a small pilot, 2 years ago	Teachers do not have agricultural experience
Escuela Amolanas	446	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	27	3	9	No	Free	Yes, depends on the ranch	200m2	Robbers	They started with a small greenhouse, 10 years ago	Teachers do not have agricultural experience
Escuela Básica Rural Jaime Prohens	13116	Tierra Amarilla	Primary School	6-13	11	1	11	Yes	Free	Yes	30m2	Materials and capacitation	They started with a small pilot, 2 years ago	
Escuela de Concentración (Los Loros)	441	Tierra Amarilla	Pre-school, Primary School starting at 5th grade	Under 5, 10-13	276	32	9	No	Free	Yes	50m2	Robbers	They started with a small greenhouse, 10 years ago	
Escuela J39 de Hornitos	11027	Tierra Amarilla	Primary School starting at 3rd grade	8-13	10	2	5	Yes	Free	Yes, but water depends of the Tank Truck	56m2	Need more people	No	
Escuela Paul Harris	445	Tierra Amarilla	Pre-school, Primary School	Under 5, 6-13	38	3	13	No	Free	Yes	30m2	Robbers	They used to, but it is gone now	
Escuela San Antonio	447	Tierra Amarilla	Primary School	6-13	8	2	4	Yes	Free	Yes, but water depends of the Tank Truck	Reduced	Materials and capacitation	Now, using pots mainly	
Escuela San Pedro	423	Copiapó	Pre-school, Primary School	6-13	225	20	11	No	Free	Yes, but only drinkable water	1000m2	Access to water	Yes, but is not in good condition because of lack of water	
Escuela Jose Joaquín Vallejos (Ma. Isabel)	11036	Caldera	Primary School	6-13	11	2	6	Yes	Free	Yes, but only drinkable water	Reduced	Materials and capacitation	No	Teachers do not have agricultural experience

Source: Ministry of Education http://www.mime.mineduc.cl/mime-web/mvc/mime/portada#

Source: Ministry of Education, Chile; As cited in 2018 Capstone Report

Source: 2018 Capstone Report

APPENDIX 5 – MAP OF SCHOOLS SELECTED FOR APECO GARDEN PROGRAM



APPENDIX 6 – QUESTIONNAIRE FOR SCHOOLS (BLANK)

Nombre de la Escuela (Name of School):
Nombre de la Persona llenando Formulario (Name of Person Filling Out the Form):
Cargo de la persona llenando el formulario (position of the person filling out the form)
Fecha (Date):

Información sobre cada escuela
Background Information about the School

Por favor, proporcione más información sobre el área donde se ubica cada escuela. ¿Es una ciudad, una aldea, un pueblo etc.? ¿Cuál es la población en esta área? ¿Qué tan cerca está de la ciudad más cercana?
Please provide some more information about the area where each school is located. Is it a city, small town, village, etc? What is the population in this area? How close is it to the nearest city?

¿Cómo estan las clases organizadas? ¿Hay cursos separados o hay estudiantes en niveles múltiples juntos en el salón? Cuando se combinan las cursos, cuáles son las edades de los estudiantes que comparten el salón?
How are classes organized? Are there separate grades or are students at multiple levels together in the classroom? When grades are combined, what are the ages of the students sharing a classroom?

¿Cuantos estudiantes hay en cada grado/nivel o en cada salón?
How many students in each grade/level or in each classroom?

Informacion sobre los huertos
Information about the gardens

¿La escuela actualmente tiene un huerto escolar?
Does the school currently have a garden?

Por favor proporcione más información sobre pasados proyectos del huerto. ¿Cómo empezaron? ¿Cuánto tiempo estuvieron activos? ¿Por qué terminaron? ¿Los maestros / empleados que trabajaron en el huerto todavía están en la escuela?
Please provide more information about past garden projects. How did they start? How long were they active? Why did they end? Are the teachers/staff that worked on the garden still at the school?

¿Sabes dónde le gustaría tener un huerto en su escuela? Por favor describa el espacio. (Dimensiones, edificios o estructuras, fuentes de agua, plantas actuales o vegetación)
Do you know where you would like to have a garden at your school? Please describe the space? (Dimensions, buildings or structures, water source, current plants or vegetation)

En conversaciones anteriores, muchas escuelas describieron a los 'robos' como una preocupación por su jardín. Por favor, proporcione información más específica sobre este problema. ¿Es esto una preocupación en su escuela? ¿Hay un potencial para ladrones o vándalos en este lugar? ¿Hay un potencial para que los animales se coman las plantas?
In previous conversations, many schools described "robbers" as a concern for their garden. Please provide more specific information about this issue. Is this a concern at your school? Is there a potential for thieves or vandals at this location? Is there a potential for animals eating the plants?

¿La escuela tiene alguien que pueda servir como un "líder del jardín" que se apasiona con el proyecto y puede ayudar a otros a ser apasionados también? ¿Quién es esta persona y cuál es su rol actual?
Does the school have someone who can serve as a "garden champion" who is passionate about the project and can help others be passionate also? Who is this person and what is their role?

APECO y la Universidad de Cornell se asociaron para planificar esta iniciativa y medir el impacto que los jardines tendrán en los estudiantes y la comunidad. ¿Hay alguna restricción para hacer esta investigación en esta escuela?
APECO and Cornell University are partnering to plan this initiative and measure the impact the gardens have on the students and the community. Are there any restrictions for doing this research at this school?

APPENDIX 7 – QUESTIONNAIRE FOR APECO (WITH ANSWERS)

Answers provided by Maria Jose

Información adicional necesaria de APECO
Additional Information needed from APECO

¿Cómo se seleccionaron estas nueve escuelas para el programa de jardínes escolares? ¿Cuál fue el criterio utilizado para la selección?
How were these nine schools selected for the school garden program? What was the criteria used for the selection?

The selection criteria is related with the type of schools, the association selected all the rural schools of the Copiapo Valley.

Algunas de las recomendaciones para el proyecto incluirán el apoyo que APECO puede brindar a la escuela que participaria en el proyecto. Describa si APECO está abierto a las siguientes ideas y las formas en que puede apoyar a las escuelas en estas áreas:
Some of the recommendations for the project will include support that APECO can provide for the school participating in the project. Please describe if APECO is open to the following ideas and the ways that you may be able to support the schools in these areas:

1. Materiales para construir y mantener los jardines (Materials for building and maintaining gardens):
   Yes, once we have the costs identified, the idea is that our associates help with both.

2. Visistar escuelas para asesorar la colocación y el diseño del jardín (Visiting schools to advise on garden placement and design):
   Yes, the idea is to have a professional from APECO helping with this.

3. Visitar escuelas para ayudar con la plantación inicial de jardines (Visiting schools to assist with initial garden planting):

   Yes, same as last question

4. Brindar apoyo en la construcción de infraestructura de jardines, incluyendo la irrigación (Providing support in constructing garden infrastructure, including irrigation):

   Yes

5. Entrenar maestros o empleados sobre el cuidado del jardin en el lanzamiento inicial y durante el curso de todo el programa (Training teachers or school staff on caring for garden at initial launch and continuously throughout the program):

Yes, APECO will help with this, but also the idea is to develop a partnership between APECO and the department of Education to develop some material.

6. Colaborar con maestros en la creación de un plan de estudio para integrar el jardín en las lecciones de otras materias (Collaborating with teachers on creating curriculum to integrate garden into lessons in other subjects):

   Yes, also integrating the department of education, the department of environment and other government agencies.

7. Por favor describa cualquier otra forma en que APECO pueda participar en los jardines escolares (Please describe any other ways APECO is able to be involved in the school gardens):

APECO is open to any further collaboration not listed above if that is justified and will help to accomplish the School Gardens project.

APPENDIX 8 – APECO SCHOOL GARDEN PROGRAM LOGIC MODEL

Objectives:

1. Engagement with and deeper understanding of natural environment and importance of agriculture
2. Learn about climate change, environmental impacts, water scarcity, and agricultural practices to mitigate these
3. Diversified diets and increased nutrition education
4. Increased access to affordable healthy food, decreased household food expenditure
5. Develop entrepreneurial and business skills from processing and selling food
6. Increased opportunities for physical activities and decreased obesity

INPUTS	**ACTIVITIES**	**OUTPUTS**	**SHORT TERM OUTCOMES**	**MID TERM OUTCOMES**	**LONG TERM OUTCOMES**
APECO resources, knowledge, connections, expert personnel	APECO visit schools for garden design and planning	School gardens in 9 schools (number of gardens created)	**Students** have an increased knowledge of sustainability and environmental issues	**Students and families** demonstrate behaviors promoting sustainability in their homes	**Students** pursue careers in sustainable agriculture
Engineer/architect to design gardens	With support from APECO and growers, prepare schools for gardens with infrastructure and irrigation	**Students** have hands-on experience with vegetable gardens, tree nurseries, animal care (number of hours)	Change in attitudes towards and increased interest by **students** in sustainable agriculture	Increased consumption of fresh fruits and vegetables for **students and families**	**Students** have marketable skills for careers in agriculture and food production
Contributions from growers, including financial and participation in programming	Training schools on how to care for gardens		**Students and families** show increased knowledge in nutrition		Increase of sustainable agriculture practice in the **community**

Collaboration with Cornell University and CIPA Capstone teams	Teachers and school administrators plan curriculum and integration with other subjects		**Students** increase number of hours per week of physical activity		Decrease in rates of childhood obesity among **students**
Time and management capacity of school administrators and teachers	APECO representatives develop relationship with government bodies including Department of Education and Department of the Environment				
	Implement gardens in schools in phased order				
	Ongoing events at schools to cultivate excitement and commitment				

APPENDIX 9 – EVALUATION MATRIX

	Environmental Awareness and Stewardship	**Nutrition Knowledge and Diversified Diet**	**Physical Activity**
Students	Knowledge of environmental issues (survey; reflective journal)	Rate (number of servings, number of meals per week) student eats fresh fruits and vegetables during lunch (after lunch food tracker) Knowledge of healthy nutrition (healthy plate drawing activity; survey) Preference for fruits and vegetables (taste test)	Number of hours of physical activity (activity monitors) Knowledge of the importance physical activity and ways to be active (reflective journals)
Parents	Knowledge of environmental issues (survey) Number/percent of families that compost, recycle, garden (survey) Observed changes (focus groups, interviews, surveys)	Nutrition knowledge (survey) Rate (number of servings, number of meals per week) family eats fresh fruits and vegetables with breakfast and dinner (food diary) Observed changes (focus groups, interviews, surveys)	Number of hours students participate in physical activity (observation) Observed changes (focus groups, interviews, surveys)
Teachers/School Administrators	Knowledge of environmental issues (survey) Observed changes (focus groups, interviews, surveys)	Observed changes (focus groups, interviews, surveys)	Number of hours students participate in physical activity (observation) Observed changes (focus groups, interviews, surveys)
Community	Rates of recycling, composting, use of alternative power sources (source for data collection still TBD)	Number of people shopping at farmers' market or equivalent (source for data collection still TBD)	Rates of childhood obesity and rates of obesity-related diseases (source for data collection still TBD)

APPENDIX 10 – SAMPLE STUDENT SURVEY

Name:
Age:
School:
Grade/Level:
Name of Teacher:
Gender:

My school currently has a garden: ☐ Yes ☐ No

What grade were you in when you first had a garden at your school?

- ☐ 1st grade
- ☐ 2nd grade
- ☐ 3rd grade
- ☐ 4th grade
- ☐ 5th grade
- ☐ 6th grade
- ☐ 7th grade
- ☐ 8th grade
- ☐ Other: _____
- ☐ I've always had a garden at my school
- ☐ I don't know

How many times per week do you visit the school garden with your class?

- ☐ Never
- ☐ Once every few weeks
- ☐ Once per week
- ☐ Twice per week
- ☐ Almost everyday
- ☐ Everyday

How many times per week do you visit the school garden on your own, outside of class?

- ☐ Never
- ☐ Once every few weeks
- ☐ Once per week
- ☐ Twice per week
- ☐ Almost everyday
- ☐ Everyday

I enjoy when my class visits the garden


Strongly Agree


Agree


Neither Agree Nor Disagree


Disagree


Strongly Disagree

Which activities do you enjoy doing in the garden? (Circle all that apply)

- ☐ Planting
- ☐ Caring for the plants (weeding, watering)
- ☐ Harvesting fruits and vegetables
- ☐ Science lessons in the garden
- ☐ Writing and other lessons in the garden
- ☐ Drawing and making art
- ☐ Looking at the plants and animals
- ☐ Other: _____

Because of the school garden I have learned about (Circle all that apply)

- ☐ Gardening skills
- ☐ Healthy foods and activities
- ☐ Different kinds of jobs I can do when I grow up
- ☐ Problems with the environment
- ☐ Water conservation
- ☐ What I can do to help the environment

Please circle the choice that best represents how you feel:

1. I like to learn about nature:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
2. I like to read about plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
3. I would give some of my own money to help save wild plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
4. I like to spend time outdoors in nature:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
5. I am interested in learning ways to help protect plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
6. My actions have the possibility to affect the environment:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
7. My life would be different if there were no plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
8. Nature is easily harmed or hurt by people	Strong Agree	Agree	Neither	Disagree	Strong Disagree
9. We need to take better care of plants and animals:	Strong Agree	Agree	Neither	Disagree	Strong Disagree
10. I think it is important for people to make changes to prevent the climate getting warmer:	Strong Agree	Agree	Neither	Disagree	Strong Disagree

Which of the following activities have you done AT HOME this year? (Check all that apply)

☐ Write someone a letter about an environmental problem that is important to me.

☐ Talked with my parents about how to help with environmental problems

☐ Turn off the water in the sink while I wash my hands to conserve water

☐ Turn off lights when they are not in use to save energy

☐ Separate cans, bottles, paper, or magazines for recycling

☐ Put your food scraps in a compost

Which of the following activities have you done AT SCHOOL this year?

☐ Write someone a letter about an environmental problem that is important to me.

☐ Talked with my teachers about how to help with environmental problems

☐ Turn off the water in the sink while I wash my hands to conserve water

☐ Turn off lights when they are not in use to save energy

☐ Separate cans, bottles, paper, or magazines for recycling

☐ Put your food scraps in a compost

Additional questions for students in higher grades:

1. Burning coal for energy is a problem because it:
    a. Releases carbon dioxide and other pollutants into the air
    b. Decreases needed acid rain
    c. Reduces the amount of ozone in the stratosphere
    d. Is too expensive
    e. Pollutes the water in aquifers

2. Which is an example of a perpetual energy source?
    a. Nuclear
    b. Oil
    c. Wood
    d. Uranium
    e. Solar

3. The most pollution of our water sources is caused by:
    a. Dams on rivers
    b. Chemical runoff from farms
    c. Methane gas
    d. Leaks in the sewers
    e. Human and animal wastes

4. An example of a nonrenewable resource is:
    a. Petroleum
    b. Trees
    c. Ocean water
    d. Sunlight
    e. Animals raised for food

Correct Answers:

1. A
2. E
3. B
4. A

Which of the following is an example of a healthy snack? (Check all that apply, there can be more than one)

☐ Ice Cream 

☐ Banana 

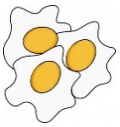
☐ Empanada 

☐ French Fries

☐ Apple 

Which of the following foods is a good source of protein? (Check all that apply, there can be more than one)

☐ Carrots 

☐ Eggs 

☐ Steak 

☐ Pizza 

☐ Bread 

In which picture is the child exercising? (Check all that apply, there can be more than one)

☐ Playing video games

☐ Watching TV

☐ Doing homework

☐ Dancing

☐ Doing chores

☐ Gardening

☐ Playing Football

Additional questions for students in higher grades:

1. Drinking milk is important because it provides calcium which helps us to…
    a. Grow healthy bones
    b. Have more energy
    c. Prevent illness
    d. Get smarter

2. What do calories measure?
    a. Fat
    b. Energy
    c. Salt
    d. Sugar
    e. Protein

3. A smoothie has strawberries, yogurt, and orange juice. Which of the food groups does this snack contain?
    a. Grains
    b. Fruit
    c. Vegetables
    d. Dairy
    e. Protein
    f. Fats

4. Certain fats, like trans fats, can clog your arteries
    a. True
    b. False

Correct Answers:

1. A
2. B
3. B and D
4. A

APPENDIX 11 – SAMPLE PARENT SURVEY

Information about yourself:

What is your gender: _____

What is your age:

☐ Under 20 ☐ 30-39 ☐ 50-59 ☐ 70 or older

☐ 20-29 ☐ 40-49 ☐ 60-69

What town do you live in? _____

What is your occupation: _____

Information about your child/children:

Which primary school does your child/children attend?

☐ Colegio Félix Susaeta (Manflas)

☐ Escuela Amolanas

☐ Escuela Básica Rural Jaime Prohens

☐ Escuela de Concentración (Los Loros)

☐ Escuela J39 de Hornitos

☐ Escuela Paul Harris

☐ Escuela San Antonio

☐ Escuela San Pedro

☐ Escuela Jose Joaquín Vallejos (Ma. Isabel)

Please provide the age, grade level, and gender of each of your children:

Child 1 – Age: _____ Grade: _____ Sex: _____
Child 2 – Age: _____ Grade: _____ Sex: _____
Child 3 – Age: _____ Grade: _____ Sex: _____
Child 4 – Age: _____ Grade: _____ Sex: _____
Child 5 – Age: _____ Grade: _____ Sex: _____

Environment and Sustainability

Which of the following activities do you and your family do at home? For each activity that you do, please indicate approximately how often.

☐ Discuss issues in the environment and how we can help	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Write a letter or email to an official about an environmental issue that is important to me or my family	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Turn off the water in the sink while washing hands or brushing teeth to conserve water	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Turn off lights when they are not in use to save energy	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Separate cans, bottles, paper, or magazines for recycling	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Put food scraps in a compost	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year

Please select the choice that best represents how you feel:

1. Nature is valuable for its own sake.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
2. I believe protecting the environment is an important issue.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
3. The balance of nature is very delicate and easily upset.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
4. Humans are severely abusing the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
5. I cannot see any real environmental problems being created by rapid economic growth. It only creates benefits.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
6. In my daily life, I try to find ways to conserve water or power.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
7. People have been giving far too little attention to how human progress has been damaging the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
8. It makes me sad to see natural environments destroyed.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
9. I am NOT the kind of person who makes efforts to conserve natural resources.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
10. Protecting people's jobs is more important than protecting the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree

Healthy Nutrition

Which of the following does your child eat:

☐ Apples
☐ Candy
☐ Bananas
☐ Grapes
☐ Other fruits
☐ Cookies
☐ Soft drinks
☐ Corn
☐ Tomato
☐ Carrots
☐ Lettuce
☐ Other Vegetables

1. My child choose fruit for a snack	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
2. My child chooses vegetables for a snack	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
3. My child enjoys playing active games	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always
4. My child drinks soda	☐ Never	☐ Rarely	☐ Sometimes	☐ Often	☐ Always

Currently, how often does your child/children do physical activities outside of school for 30 minutes or more at a time? This can include playing sports or games with vigorous movement, dancing, cycling, gardening, housework and domestic chores, swimming, etc.

☐ Every day

☐ Four or five times per week

☐ Two or three times per week

☐ One time per week

☐ One time every two weeks

☐ One time every month

☐ Never

Garden Program

Do you have a garden at your home?

☐ A flower garden

☐ A vegetable garden for consumption at home

☐ A commercial farm

☐ Other: _____

☐ No

Does your child's/children's primary school currently have a school garden?

☐ Yes ☐ No

Is this the first year that there has been a school garden at your child's/children's primary school?

☐ Yes ☐ No

How do you feel about the garden in your child's/children's school?

☐ I like it very much ☐ I like it ☐ I am indifferent ☐ I do not like it ☐ I very much do not like it

Have you participated in activities at the school garden?

☐ Yes ☐ No

Have you witnessed any of the following changes in your children since they started participating in the school garden?

☐ Spending more time outside being physically active

☐ Interest in starting or caring for gardens or farms at home

☐ Interest in activities related to sustainability such as recycling, compost, conservation

☐ Interest in food or cooking

☐ Eating more fruits and vegetables

☐ Talking about nature or the environment at home

☐ Talking about the school garden or gardening at home

☐ Behavioral changes

☐ Other changes that you may have noticed:

_____

_____

What aspects of the garden do you like?
What aspects of the garden do you not like?
What things do you think should be changed about the garden?
Are there additional activities that you would like to see happen at the garden for students, families, or the community?

APPENDIX 12 – SAMPLE TEACHER SURVEY

Information about yourself:

What subject(s) do you teach? _____

At which school do you teach?

- ☐ Colegio Félix Susaeta (Manflas)
- ☐ Escuela Amolanas
- ☐ Escuela Básica Rural Jaime Prohens
- ☐ Escuela de Concentración (Los Loros)
- ☐ Escuela J39 de Hornitos
- ☐ Escuela Paul Harris
- ☐ Escuela San Antonio
- ☐ Escuela San Pedro
- ☐ Escuela Jose Joaquín Vallejos (Ma. Isabel)

What is your age?

- ☐ Under 20
- ☐ 20-29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60-69
- ☐ 70 or older

What town do you live in? _____

School Garden Program:

Does your school currently have a garden? ☐ Yes ☐ No

In which ways have you participated in the garden program? (Select all that apply)

☐ Coordinated design and planting

☐ Participated in planning

☐ Bring classes to the garden for lessons

☐ Organized activities with the garden for students, families, or the community outside of class time

☐ Attended garden activities or events

☐ Other: _____

☐ I have never participated in the garden program

Please describe how you use the garden for your classes:

_____

_____

Currently, how often do the children in your class do physical activity for 30 minutes or more during the school day? This can include playing sports or games with vigorous movement, dancing, cycling, gardening, housework and domestic chores, swimming, etc.

☐ Every day
☐ Four or five times per week
☐ Two or three times per week
☐ One time per week
☐ One time every two weeks
☐ One time every month
☐ Never

What changes have you observed in your students start starting the school garden program?

☐ Spending more time outside being physically active
☐ Behavioral changes
☐ Interest in caring for gardens or farms
☐ Interest in activities related to sustainability such as recycling, compost, conservation
☐ Interest in food or cooking
☐ Eating more fruits and vegetables
☐ Interest in learning or discussing nature or the environment
☐ Other changes that you may have noticed: _____

Please describe the changes you have observed in more detail. Are there any examples that you can provide?

Please select the answer that best describes how you feel about each statement:

1. The garden program is a valuable addition to my school.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
2. The garden is a useful tool for teaching my students.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
3. I have been well prepared to use the garden for my classes.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
4. The messages of the garden program, including environmental sustainability, nutrition, and physical activity, are well integrated into our school.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
5. Participating in the garden program in a good use of my time.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree

What support do you or your school need to improve the garden program?

What aspects of the garden do you like?

What aspects of the garden do you not like?

What things do you think should be changed about the garden?

Are there additional activities that you would like to see happen at the garden for students, families, or the community?

Environment and Sustainability

Which of the following activities do you and your family do at home? For each activity that you do, please indicate approximately how often.

☐ Discuss issues in the environment and how we can help	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Write a letter or email to an official about an environmental issue that is important to me or my family	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Turn off the water in the sink while washing hands or brushing teeth to conserve water	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Turn off lights when they are not in use to save energy	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Separate cans, bottles, paper, or magazines for recycling	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year
☐ Put food scraps in a compost	☐Everyday ☐Once per week ☐Once per month ☐Once very few months ☐Once per year

Please select the choice that best represents how you feel:

11. Nature is valuable for its own sake.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
12. I believe protecting the environment is an important issue.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
13. The balance of nature is very delicate and easily upset.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
14. Humans are severely abusing the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
15. I cannot see any real environmental problems being created by rapid economic growth. It only creates benefits.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
16. In my daily life, I try to find ways to conserve water or power.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
17. People have been giving far too little attention to how human progress has been damaging the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
18. It makes me sad to see natural environments destroyed.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
19. I am NOT the kind of person who makes efforts to conserve natural resources.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree
20. Protecting people's jobs is more important than protecting the environment.	☐ Strongly Agree	☐ Agree	☐ Neither Agree Nor Disagree	☐ Disagree	☐ Strongly Disagree

APPENDIX 13 – STUDENT SURVEY QUESTION BANK

Question	Type	Target Age	Source	Category
My school had a garden during this school year (2020)	True/False			Program
My school had a garden during the last school year (2019)	True/False			Program
How many times per week do you visit the school garden with my class?	Multiple Choice: 0,1,2,3,4,5			Program
How many times per week do you visit the school garden outside of class?	Multiple Choice: 0,1,2,3,4,5			Program
I enjoy spending time in the school garden				Program
What activities do you like to do in the garden				Program
Because of the school garden, I've learned about… Problems with the environment Healthy diet and nutrition Gardening skills Water conservation What I can do to help the environment	Likert			Program
School				Program/Demographics
Grade				Program/Demographics
Gender				Program/Demographics
I like to learn about nature	Likert	6-13	Larson	Attitude about the Environment

I like to read about plants and animals	Likert	6-13	Larson	Attitude about the Environment
I am interested in learning ways to help protect plant and animals	Likert	6-13	Larson	Attitude about the Environment
I would give some of my own money to help save wild plants and animals	Likert	6-13	Larson; Leeming, Dwyer, and Bracken	Attitude about the Environment
I like to spend time outdoors in nature	Likert	6-13	Larson	Attitude about the environment
I would not be willing to save energy by using less air conditioning	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
To save water, I would be willing to use less water when I bathe	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
I would not give $15 of my own money to help the environment	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
I would not be willing to separate my family' trash for recycling	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
I would give $15 of my own money to help protect wild animals	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
To save water, I would be willing to turn off the water while I wash my hands.	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
I would be willing to write letters asking people to help reduce pollution	True/False	6-13	Leeming, Dwyer, and Bracken	Attitude about the Environment
I feel like there are many things I can do to protect the environment	Likert	11-12	Ratcliffe	Attitude about the Environment

Trying to protect the environment is my responsibility	Likert	11-12	Ratcliffe	Attitude about the Environment
I would come to school on Saturday to plant flowers or work in the garden	Likert	6-13	Ratcliffe; Larson	Attitude about the Environment
My actions have the possibility to harm the environment	Likert	11-12	Ratcliffe	Attitude about the Environment
Doing things to protect the environment is a waste of time	Likert	11-12	Ratcliffe	Attitude about the Environment
People can be harmed by the climate getting warmer				
Plants and animals can be harmed by the climate getting warmer				
Plants and animals are easily harmed or hurt by people	Likert	6-13	Larson	Knowledge about the environment
My life would change if there were no plants and animals	Likert	6-13	Larson	Knowledge about the environment
Plants and animals are important to people	Likert	6-13	Larson	Knowledge about the environment
People need plants to live	Likert	6-13	Larson	Knowledge about the environment
Nature is easily harmed or hurt by people	Likert	6-13	Larson	Knowledge about the environment
We need to take better care of plants and animals	Likert	6-13	Larson	Knowledge about the environment
Burning coal for energy is a	Multiple Choice A) Releases carbon dioxide	6-13	Leeming, Dwyer, and Bracken	Knowledge about the environment

problem because it:	and other pollutants into the air; B) decreases needed acid rain; C) reduces the amount of ozone in the stratosphere; D) is too expensive; E) pollutes the water in aquifers			
The most pollution of our water sources is caused by:	Multiple Choice A) dams on rivers; B) chemical runoff from farms; C) methane gas; D) leaks in the sewers; E) human and animal wastes	6-13	Leeming, Dwyer, and Bracken	Knowledge about the environment
Which is an example of a perpetual energy source?	Multiple Choice A) nuclear; B) oil; C) wood; D) uranium; E) solar	6-13	Leeming, Dwyer, and Bracken	Knowledge about the environment
An example of a nonrenewable resource is:	Multiple Choice A) petroleum; B) trees; C) ocean water; D) sunlight; E) animals raised for food	6-13	Leeming, Dwyer, and Bracken	Knowledge about the environment
Which of the following activities have you done AT HOME this year? Write someone a letter about an environmental problem that is important to me Talked with my parents about how to help with environmental problems	Select all that apply	6-13	Leeming, Dwyer, and Bracken; Ratcliffe	Sustainable behaviors

Turn off the water in the sink while I wash my hands to conserve water Turn off lights when they are not in use to save energy Separate cans, bottles, paper, or magazines for recycling Put your food scraps in a compost				
Which of the following activities have you done AT SCHOOL this year? Write someone a letter about an environmental problem that is important to me Talked with my parents about how to help with environmental problems Turn off the water in the sink while I wash my hands to conserve water Turn off lights when they are not in use to save energy Separate cans, bottles, paper, or magazines for recycling Put your food scraps in a compost	Select all that apply	6-13	Leeming, Dwyer, and Bracken; Ratcliffe	Sustainable behaviors
Which food is an example of a carbohydrate?	Multiple Choice	8-15	Beckman and Smith	Nutrition knowledge

Certain fats, like trans fats, can clog your arteries	True/False	8-15	Beckman and Smith	Nutrition knowledge
Which of the following foods contain protein?	Multiple Choice	8-15	Beckman and Smith	Nutrition knowledge
Circle the healthy snack	Multiple Choice	5-6	Heneman	Nutrition knowledge
Circle the picture where the child is exercising	Multiple Choice	5-6	Heneman	Nutrition knowledge
Which food grows on a tree?	Multiple Choice	5-6	Heneman	Nutrition knowledge
Drinking milk is important because it helps us…	Multiple Choice	5-6	Heneman	Nutrition knowledge
Which food grows on a tree	Multiple Choice	5-6	Heneman	Nutrition knowledge
Which food is a leaf that we eat	Multiple Choice	5-6	Heneman	Nutrition knowledge
Which of the following nutrients provides energy for your body?	Multiple Choice	9-10	Heneman	Nutrition Knowledge
Our bodies need calcium to…	Multiple Choice	9-10	Heneman	Nutrition Knowledge
A smoothie has strawberries, yogurt, and orange juice. How many food groups does this snack have?	Multiple Choice	9-10	Heneman	Nutrition Knowledge
What do calories measure?	Multiple Choice	9-10	Heneman	Nutrition Knowledge
Which of the following is a low-fat healthy snack?	Multiple Choice	9-10	Heneman	Nutrition Knowledge
Which of the following is an example of being physically active?	Multiple Choice	9-10	Heneman	Nutrition Knowledge